CHEMICAL & METALLURGICAL ENGINEERING

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CHEMICAL & METALLURGICAL ENGINEERING

H. C. Parmelee
Editor

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What Price For Product X ?

A LARGE manufacturing company was making a product which we shall call *X*. Another manufacturing company, not quite so large but still fairly good sized, was also manufacturing *X*. They were competitors but still on friendly terms. The price of *X* began to get lower and lower until finally the smaller manufacturer called on the larger manufacturer and said in substance: "What's the idea of selling below cost? You can't make *X* for that price and you know it. Why, the *Y* and *Z* that you use to make the *X* cost more than your present selling price."

"But we do make a handsome profit at the present price," remarked the head of the larger company. "You see, we make our own *Y* and we sell it in the trade. But when any batches are off color and quality we turn them over to the *X* plant and of course they cost us nothing."

Perhaps if the conversation had taken place between two schoolboys, an auditor might have been moved to point out in a kindly way that after all the *Y* did cost something and that it, therefore, could not be given away to the *X* plant for nothing. But when such a reply is made by a prominent manufacturer of chemicals it makes one a little less hopeful. It brings up a fundamental question. Of what use are cost figures? Many cost accountants seem to believe that the system exists for itself; that it is an end and not a means. It must be confessed that many manufacturers seem to understand but dimly the significance of cost figures. Certainly the large manufacturer mentioned above did not have the remotest conception of their use.

Costs are a tool, a delicate, subtle tool, that must be used with precision and interpreted with an intelligent conception of manufacturing procedure. In the case of the product *X* mentioned above it must be apparent that every pound of *Y* that was used in the manufacture of *X* was paid for by the *Y* plant. Now it may have been that there was plenty of margin in the manufacture of *Y* so that, even though a considerable proportion of the production was given away, the plant could still show a profit on the books. But see what a ridiculous situation it was. The company was actually selling *X* at a price that was below the cost of production and was smugly satisfied that it was making a profit.

In this there ought to be a very obvious moral to everyone in production work. Are you sure that your cost accounting system is intelligently constructed and intelligently operated? Are you sure that you understand it and that it fits in with operating practice? Perhaps the old phrase, "A word to the wise is sufficient," might be invoked. Then perhaps the price of *X* and of dozens of other commodities would be based on facts or on clear-cut policies, rather than on that novel arithmetical scale in which 2 plus 2 is 5.

A Word of Caution About Purchasing

BUSINESS is good. On that point nearly everyone will agree. Some will undoubtedly want to qualify the adjective with a pretty good or fairly good. Some will even admit that business is very good. In fact, it was a group of such men that rather inspired the thought that business might be too good. The memory of 1921 is still fresh in the minds of many business men and they fear, when a large order is received, that it may be too large. They would prefer, in other words, to have steady business than a tremendous peak for a season and then a period of non-production. Such thoughts and queries bring up the very basis of purchasing.

No generalization is safe on the subject, for conditions vary with each commodity. Soda ash and caustic are usually purchased on a fairly rigid contract. Acid contracts, on the whole, are likely to be less rigid. Large consumers of linseed oil frequently make as much money from speculative buying as from their final product. But no matter what the conditions, there is a tendency as in every other commodity and every other industry to buy heavily on a rising market; or, to put it another way, to buy heavily during times of boom and prosperity. This tendency more than any single thing inflates prosperous times and makes periods of depression more serious.

One of the leaders in the railroad field has made the constructive suggestion that the railroads and the government combine to distribute the purchase of steel and other railroad equipment in such a way as to prevent inflation and to lessen the periods of depression. The suggestion has much to recommend it, for with steel on a more even basis of production, both coal and sulphuric acid would tend toward the same desirable mean. The interdependent materials are legion and this single move would do more to steady production than any single thing. But there is something everyone can do that will react to his own benefit as well as to that of his industry. Examine purchases of materials and supplies, bearing in mind economic conditions at the moment. Do not double an order because there happens to be plenty of money in the bank at the time. There is for a given commodity an optimum quantity to order. More than that is wasteful and less than that is dangerous or foolish. There is no formula by which this quantity can be determined for a given material, for it will depend on conditions that are always changing. There is, however, one thing that can be said with certainty. Don't select an arbitrary quantity for purchase. Base it on an intelligent economic analysis.

Chemistry in the Service of National Defense

SCEPTICISM is sometimes justified in the evaluation of what is claimed as an advance in science or in the application of science to industry. The reported verdict of General Amos Fries, that the so-called death ray should be classed among the host of "inventions" that fail to materialize as practicable developments, was doubtless a sound one; but it is regrettable that an official opinion of this character is so often taken as a text for a wholesale denunciation of science and chemistry in the service of national defense. A columnist in a leading newspaper on the Pacific coast recently elaborated General Fries' conclusion by affirming that "The only really remarkable thing about the deadly 'death ray' was that the inventor could make grown-up newspaper men believe . . . that wars of the future would consist of two rival professors sitting in laboratories—squirting death at populous cities—wiping out whole nations like lizards spearing flies. The real lesson that military experts learned from the World War," he concludes, "was this: That the new-fangled gas attacks, tank attacks and fire-throwing attacks were mostly bunk." A callous disregard of fact makes prophecy an easy matter for our columnist. Inspired by an article written by an officer of the General Staff at Washington, which appeared in one of the magazines recently, he states his opinion that "war, in the final analysis, must, forever, be man against man. . . . The deciding factor in the next war will be a hand-to-hand struggle with bayonets. . . . So you see," he says, "in place of advancing to some new and fanciful 'death ray,' war is going back to the old days of knighthood—with every knight for himself."

Well, the so-called death ray may be "the bunk"; but let us not forget that in the period of initial development an overwhelming majority of people have given the same verdict in regard to the feasibility of almost every great invention the world has ever seen. However, if the death ray is "the bunk," this talk about a reversion to the old days of knighthood is "the super-bunk." Moreover, it is mischievous propaganda, calculated to hypnotize the people of this country into a sense of false security, to discourage adequate research and development along chemical and engineering lines such as is being feverishly pushed to fruition by other nations.

It is an amazing fact that recent history, the repetition of which is encouraged by frothy newspaper journalism, can be forgotten so easily by writers of normal intelligence. It is as well to recall the fact that, although Great Britain did not lose the war, she lost the major credit of winning it mainly because of a disregard of the value of engineering and chemistry. In 1914 and 1915, officers of the regular British army, hidebound by tradition based on the heroic exploits of the unscientific past, and with an open contempt for the achievements of the chemist and the engineer in private life, fostered and encouraged the formation of combatant troops of technical men, whose brains had been developed in the laboratory and sharpened by the keen competition of professional practice. At that stage it was common to hear officers of the Royal Engineers remark that no civilian helpers were needed. Chemical warfare was unknown. In the field, the knighthood of Great Britain was matched against the science of Germany. The result is well known. Many, many disastrous months intervened before Great Britain had organized a chemical warfare service, the head of which had been obliged to enlist as a private and work his way up through the ranks to a position where his ability and experience could be utilized for the benefit of his country.

The ideals of medieval knighthood, like free trade, provide a fine standard if everyone would agree to follow them. This consummation, however, is unthinkable. We live in an age of chemical and engineering achievement. The materialism and certainty of science is beyond question: The bombardment of electrons proceeds without regard to moral codes; the rude displacement of elements and compounds by chemical action ignores all the rules of polite society; the adhesion of an adsorptive is indecent in its persistence. If war is to come, and to many this seems inevitable, it is inconceivable that progressive nations of the earth will not take every advantage of recently acquired knowledge in the field of technology and science; it is inconceivable that, on one side at least, chemistry will not play an important if not a terrible part in the struggle for victory. It behooves us all, therefore, to use our collective and individual influence in favor of a campaign of research and preparedness, whereby the Chemical Warfare Service of the United States may be subsidized to an extent far exceeding the insignificant proportion of the army allotment now received.

Authoritative Publicity as a Real Service to Industry

IN PUBLISHING in this issue Dr. Charles E. Munroe's review of industrial fires caused by sodium and potassium nitrates *Chem. & Met.* is rendering a service that is not always appreciated by those it benefits most. Thus there are some in our industries who hold that the less said or written about such things as the hazards of fire or explosion the better the chemical industry is likely to stand in the estimation of the industrial community. That this view may prove extremely short-sighted was well demonstrated by an occurrence some months ago that closely parallels the present situation.

Immediately following the disastrous explosion of ammonium nitrate on March 1, 1924, at the plant of the Ammonite company in Nixon, N. J., the local, state and federal authorities began a number of independent investigations. It was our privilege to be present in the court house at New Brunswick when the first of these inquiries was initiated and we were surprised to hear the mass of conflicting opinion on ammonium nitrate and the part it had played in several memorable industrial disasters. Almost in desperation the prosecutor asked if there was not some impartial and authoritative text to which he could turn for the scientific facts regarding the behavior and properties of the chemical in question. Several present recalled the article on "The Explosibility of Ammonium Nitrate" by Dr. Munroe which had been published in *Chem. & Met.* almost 2 years before the unfortunate occurrence at Nixon. A hasty trip to the nearby library of Rutgers College produced a bound volume containing the desired article and this was gratefully received by the authorities, who referred to it constantly throughout the remainder of the investigation.

In his article in the March 22, 1922, issue Dr. Munroe contributed a critical analysis of the major

accidents in which ammonium nitrate was involved. It is just such a contribution to our knowledge of sodium and potassium nitrates that the same distinguished author now presents in the current issue of *Chem. & Met.* The careful study Dr. Munroe has given to this subject, combined with his long experience in connection with explosives investigations for the Bureau of Mines and the National Research Council, is ample guarantee of the authority with which he writes. *Chem. & Met.* publishes the article with the certain belief that it is a service that will prove of constructive value to the chemical engineering industries.

Oil-Shale Imaginings

WE HAVE the publisher's assurance that "Sanford E. Bell, the writer of 'Some Facts About Shale,' is a scholar of very high rank, widely and favorably known in higher academic circles. He has held professorships in the State Universities of Indiana and Colorado. He is one of the best-informed men in the country upon all phases of the shale problem." No investigation of this subject would therefore be complete without an analysis of the statements and claims made by the author of the pamphlet, who, strange to relate, has recently concluded at Los Angeles a series of lectures on—theosophy! He appears, however, to have an interest in the success of the schemes of one A. M. Beam, of Denver, who claims that shale deposits constitute an important reserve of base and precious metals.

The booklet, "Facts About Shale," commences with the usual generalities culled from encyclopedic sources. The technology of refining is given passing mention, as a preliminary to the bait that "It has been discovered that oil is only one of several valuable commercial products in shale . . ." Our informant avers that "the crude oil manufactured from shale is composed of animal and vegetable fats"; but "there are many other products, several of which may prove . . . to be more valuable than the oil." The appeal to the credulous is graduated with skill. Paraffin is one of these products of shale, according to Dr. Bell, "reported to be the principal product of the large Catlin shale plant at Elko, Nevada." Follows one of the gems of the collection: "The nitrates of commercial value which are found in shale are ammonium sulphate and potash." This from a scholar of very high standing—in theosophy, perhaps! "The many assays made in our own laboratories at Denver, Colorado, show the shales from Wyoming, Utah and Colorado to carry from 30 to 90 pounds of ammonium sulphate and from 30 to 88 pounds of potash per ton. As the recovery of these nitrates involves very little expense and does not interfere with the recovery of any other values, they can be made a very profitable part of the industry."

The foregoing, however, is merely a prologue to a tantalizing glimpse of wealth beyond the dreams of avarice. The section on "Metals in Shale—Gold, Silver, Platinum and Zinc," constitutes the trump card. The fact that shales are of sedimentary origin is utilized to serve as a preliminary to a discourse on placers, giving an opportunity for quotations from the standard geologic textbooks of Geike (*sic*) and Dana. "During the past 5 years," says Dr. Bell, "the laboratories with which I have been connected have assayed between 200 and 300 samples of shale from Colorado, Wyoming and Utah, for gold, silver and platinum, particularly . . . Ninety per cent of the assays have shown values in gold of from \$4 to \$45 per ton of shale; values in silver of from \$2.50 to \$16 per ton; values in platinum of from \$4 per ton to more than \$200 per ton . . . Some of the shales of Wyoming have run as high as 90 pounds of zinc per ton of shale. *Laboratories that cannot recover these values simply acknowledge their own inefficiency.*" The italics are ours. Most of the reputable chemists in this country are therefore under indictment. A letter from one of the "best-known consulting engineers in the United States" is appended. "It speaks for itself," we are told, "and would be weakened by comment." Well, we are inclined to do the weakening. The writer, W. C. Kirkpatrick, of Chicago, confirms the optimistic estimates of Dr. Bell as to the metallic content of shale. The process of "substantiation" is interesting. He says, "At first we found no metallic values except iron, but by using the Beam method, his last, or sixth test, gave \$10.80 in gold, \$1.68 silver and \$5.60 platinum per ton of shale. . . . I also know," he concludes, "that nearly all the best known metallurgists hoot and ridicule the idea, and do so without trying any except the old methods of making determinations, and in doing this they are temporarily hurting the industry and permanently making fools of themselves." This summarizes our informant's opinion of the members of the profession of chemistry, metallurgy and assaying in the United States. We confess that life is complex: How to reconcile this sweeping and unjust denunciation with the theosophical ideals openly espoused by Dr. Bell—"to be tolerant, to aim high and work perseveringly for the realization of universal brotherhood"—is beyond us.

The final statement is an indirect appeal to the pocket book, as an indication of the course that will probably be followed by these promoters and their agents. The venture is "substantial and safe"—for Dr. Bell, apparently. "It is so free from the many elements of risk that are inherent in most industries. The raw material is already prepared by nature in exhaustless quantities; it is accessible! its values can all be accurately estimated"—by the Beam method, we infer—"its costs all calculated in advance, its profits foreseen. It resolves itself into the problem of *efficient* and *honest* management."

The name of Beam has long been associated in Denver and the West with unscientific, half-baked and unsuccessful methods of ore-treatment; also with methods of assaying that have yielded results unobtainable by ordinary processes. That this prolific inventor should now have transferred his talents and affections from ore to shale is merely indicative of the fact that the newer field is more productive of suckers than the older. With a theosophist on his staff, it remains only for Beam to complete the organization by alliance with a clairvoyant.

Shale-oil ventures have too frequently been associated with unsavory promotion methods, based on appeals by the technically ignorant and the morally unscrupulous. The publicity being given to the operations of such individuals is hurtful to progress, it shadows with a cloud of suspicion the honest efforts of legitimate producers, and it suggests to the public at large that reputable chemists and experienced metallurgists are ignorant of the fundamentals of their work. For these reasons we feel justified in demanding a cessation of so mischievous a propaganda.

A New Vision of Business and Executive Responsibility

Secretary Hoover Enunciates the Modern Creed of Service in Business at a Banquet Given in Honor of Owen D. Young to Commemorate His Services on the Reparation Commission

Wide World Photos

Owen D. Young

An occasion is often memorable for many reasons. So it was with the unusual tribute tendered to Owen D. Young by his fellow citizens. It was memorable because of the distinguished company, because of the greetings from the foreign governments, because of the investiture of the guest of honor with the Commandership of the Legion of Honor of France, and it was memorable because of the address of Herbert Hoover, Secretary of Commerce. Mr. Hoover was long ago recognized as a leader in his profession. He has proved in Belgium and in the Department of Commerce that he has rare qualities as an executive and in such a message as this he has shown himself to be a real leader with a vision and an idealism that are an inspiration to those whom his influence touches. We are all surrounded by routine and our contacts are sometimes sordid. But such an address supplies the leaven for our business lives and helps us again to focus our eyes on the stars of ideals, of progress and of hope.

Herbert Hoover

THE occasion was felicitous and the company that attended somehow sensed that it was and gave expression to their enthusiasm with a spontaneity that made the occasion not only felicitous but memorable. Owen D. Young, citizen of the United States of America, was honored by citizens for his service in aiding European reconstruction. Congratulated by the President and by two members of the Cabinet, greeted by the Prime Ministers of the allied nations, praised by his distinguished collaborators and honored by his fellows, Mr. Young accepted the ovation gracefully and modestly, seeming to see in it "an expression of satisfaction and of pride that America, after a period of hesitation and doubt, has played her part in an effort of peace as she did previously in the effort of war."

He spoke of General Dawes' part in the creation of the Dawes plan as being analogous somewhat to that of a master salesman who created a demand for the plan whatever it was going to be before it was even formulated. So positive was the demand that even the German conservatives did not dare risk incurring the resentment of the people in rejecting any part of it. He then took up the character of the report.

"One listening to its enthusiastic advocates would think it an inspired document which, taking account of the great international racial, financial and social currents of the world, had solved completely, and perhaps forever, those great problems. One listening to its worst enemies would feel that the plan was a mere superficial veneer which was bound to crack and disintegrate with the burning passions and the freezing selfishness which it concealed. Let me say that in my view both of these estimates are wrong.

"The committee set about its work in quite a different spirit. It was in the spirit of the scientific research worker from whom we are all learning so much. Knowing that great forces exist, he does not try out of hand to build a machine which will harness them, and then sit back and say that the machine is finished for all time. Not at all. He tries to find out the character of the forces and something about their nature, direction and intensity. So our committee sought to make a machine which would indicate, and in some degree measure, the extent and direction of these international economic forces with which we had to deal, and we tried also to insulate the machine so far as possible from the cross-currents of domestic politics in order that the measurements might be more correct. To be precise, we preferred not to speculate on what Germany could pay; we sought a machine which would demonstrate both her ability and her will to pay."

This was the setting and the spirit of the occasion for Hoover's address. It was only one of a group of addresses all tuned to the occasion, but it made a profound impression on the company and it will take its place as a classic in the expression of industrial idealism. We are glad to reproduce it below.

The World's Benefit From the Dawes Plan And a New Conception of Industrial Trusteeship

By Herbert Hoover

The German reparations had become one of the world's most dangerous inheritances from the war. The sequent failures in its adjustment had poured an increasing stream of conflict into international life, carrying with it political jeopardy and economic demorali-

zation with its train of millions of unemployed and suffering.

The accomplishment of its settlement involved great economic questions of production and distribution, of currency, of credit, of taxes and of exchange. Solution has been found in denominations of money and goods, in the creation of complex agencies of finance and government. But there springs from the settlement something far greater than the denomination of these quantities and the working of this machinery of government. It has turned millions of men from discouragement to hope. It has revived the forces of courage and enterprise. It has done even more. It has defeated the forces of hate, and advanced the tide of peace in the hearts of men.

While this adjustment primarily advances the welfare of the nations of Europe, it reaches far afield in the world. Unemployment and suppressed production anywhere in the world are in the long view a world loss. This restoration of confidence and hope and enterprise, this restoration of commerce, of productivity and of employment, this relief of suffering in a great nation, is a world asset. As a people we also participate in its blessings. Some part of our growing demand for labor, some part of the increased prices already realized by our sorely distressed agriculture, have come from this restoration of economic vigor and hope in Europe. It is a great thing to have contributed so much to this achievement.

A Triumphant Statesmanship

The wounds to our complex and intricate civilization from the war were so deep and so vital that many had despaired lest statesmanship would be unequal to their healing. Six years since the armistice seems a long time to those who live it and partake of its anxieties. Six years is a trifle in human history, and yet within it, one by one, these great problems of reconstruction have been solved. Surely in this new accomplishment for which we justly give tribute tonight we see again confidence, hope and faith in human institutions.

Some have doubted whether the enormous liabilities established under this settlement can be discharged. There are those who have contended that no great external contributions from one nation to another can be economically sustained. Without debating this question, I may be permitted to offer one thought in this connection. The payments provided in such settlements must find their substance from production and economic services rendered. These international obligations are huge burdens, but in the course of years any burden shrinks in weight in proportion as the productivity of a nation grows. When the world keeps peace it doubles its international trade once in nearly every score of years. The advancement of science, of invention and of industry has shown an unceasing contribution to the productivity of peoples. The burdens of the Napoleonic wars were at that time also debated as being insuperable. It was contended that the world would break down under them, and yet a score of years later they bore so lightly that their dangers were no longer discussed. Indeed the processes of industry and commerce are the cells which heal the injuries of the economic world. They cannot multiply in the noxious air of conflict and political uncertainty. The settlement to which our guest has contributed so much clears the atmosphere, and the magical multiplication of these cells will quickly provide the strength to meet the burdens—if the world keeps the peace. But beyond even these special occasions of vivid public service, Mr. Young has made a still further contribution to American life—perhaps the greatest of all his contributions. That is in his display of the fine sense of the responsibility which today rests upon those who administer our largest industries.

The Trusteeship of Executive Leadership

Manufacture and distribution on a vast scale is the foundation of our high standards of living and the general comfort of our people. It can be accomplished in no other way than through the development of great units of production. With their development have come innumerable problems of public relationship and public responsibility. We are in fact today witnessing a rapid evolution and perhaps a silent revolution in the relationship of great business to our social system. We are struggling to preserve the fundamental stimulus of action, of initiative and competition, to hold open the avenues of opportunity. At the same time we are struggling to gain the benefits of co-operative action. In this period of evolution nothing is more needed than clear vision of their public responsibilities on the part of our industrial leaders. For here is a triple trusteeship—a trusteeship to the owners who ultimately must be comprised from the savings of those who endeavor to provide security for their dependents and for their old age. These must have proper stimulative return as a reward for their enterprise and their self-denial. There is the trusteeship for a vast body of employees that they should have stability in employment and a sense of security for work conscientiously performed, that they should have a growing standard of living and comfort, and full opportunities for recreation and education. There is an equal trusteeship to the whole public who are served by the products of these enterprises. It is in the public interest that the product should be multiplied; should be given with every advantage of technical excellence and service. Constant gains to each group depend upon the elimination of waste and the constant development of science and invention, of increasingly more efficient organization. Beyond this again these organizations must be held high in the business and ethical relations by the character of their leaders. They must be conducted in a fine sense of non-interference with human rights.

I know of no responsibility larger than that imposed upon the headship of great industries, for from their leadership and their vision must come not only great contributions to our economic progress but upon it depends the solution of the many social problems which confront us. We have a real and growing measure of this sense throughout American industry. And Mr. Young has been the expression of such leadership.

Service as Citizen

There is one final thought to which I should like to give expression. Our friend and his colleagues in entering upon this mission to Europe, and in contributing so much to its high accomplishment, occupied the unique position of private citizens. Mr. Young is honored tonight as a private citizen. Does this not illuminate the potency and possibilities of private citizenship in a real democracy? Here is a world service of sublime accomplishment rendered by individuals bearing none of the trappings of public office but who nevertheless were accepted as the representatives of the intelligence and instinct, good will and faith of the American people—and represented it to the pride of their countrymen.

Fire, the Great Destroyer of Industry

Tracing the Path of Destruction in Jersey City's Recent Conflagration

Both of the photographs above were taken from the corner of Essex and Warren Sts. At left the firemen are fighting the nitrate fire after it had spread through the L-shaped property of Battelle & Renwick and is sweeping across Essex St. to the 10-story building of the American Sugar Refining Co. The dense black cloud above the flames is said to be typical of nitrate fires. The view at the right shows the scene after the fire had completed its destruction and had left the former sugar refinery a gaping ruin. Beyond it stands the slightly damaged warehouse of Colgate & Co., and in the distance is the plant of the Rogers-Pyatt Shellac Co.

Below are to be seen the ruins of the saltpeter works of Battelle & Renwick. The view at the left is taken from the Morris St. side, where the fire had its origin. The wall in the background is that of the Richards Chemical Works, which escaped with practically no damage. The stack in the right-hand picture is of the power plant of Battelle & Renwick, the only portion of the company's property not destroyed by the fire.

Photographs by Underwood & Underwood.

The Jersey City Nitrate Fire

A Great Disaster That Should Have in It a Lesson for All Who Deal With Sodium and Potassium Nitrates

SODIUM and potassium nitrates are not *per se* combustible materials, yet as oxygen carriers they have figured prominently in conflagrations that have caused tremendous loss of property in the chemical engineering industries. Most recent of these disasters was the fire in Jersey City that completely destroyed the plant of Battelle & Renwick and carried its scourge of destruction to other plants, buildings and homes in the immediate vicinity. The progress and extent of this destruction may readily be traced from the accompanying map and photographs.

The fire started just before 9 o'clock on the morning of Nov. 14, 1924, in the cellar of the 5-story building at 107-21 Morris St. Much of the flooring and woodwork of this building, which was of the familiar mill-type construction, had been saturated with nitrate during its long occupancy and, once kindled, the fire burned with great intensity and extreme rapidity. Fanned by a strong wind from the northwest, the flames were carried through the L-shaped building and across Essex St. to a large 10-story warehouse formerly a factory of the American Sugar Refining Co. and more recently leased in part to Colgate & Co. for storage purposes. Rows of tenement houses fronting on Washington and Essex Sts. were also badly damaged.

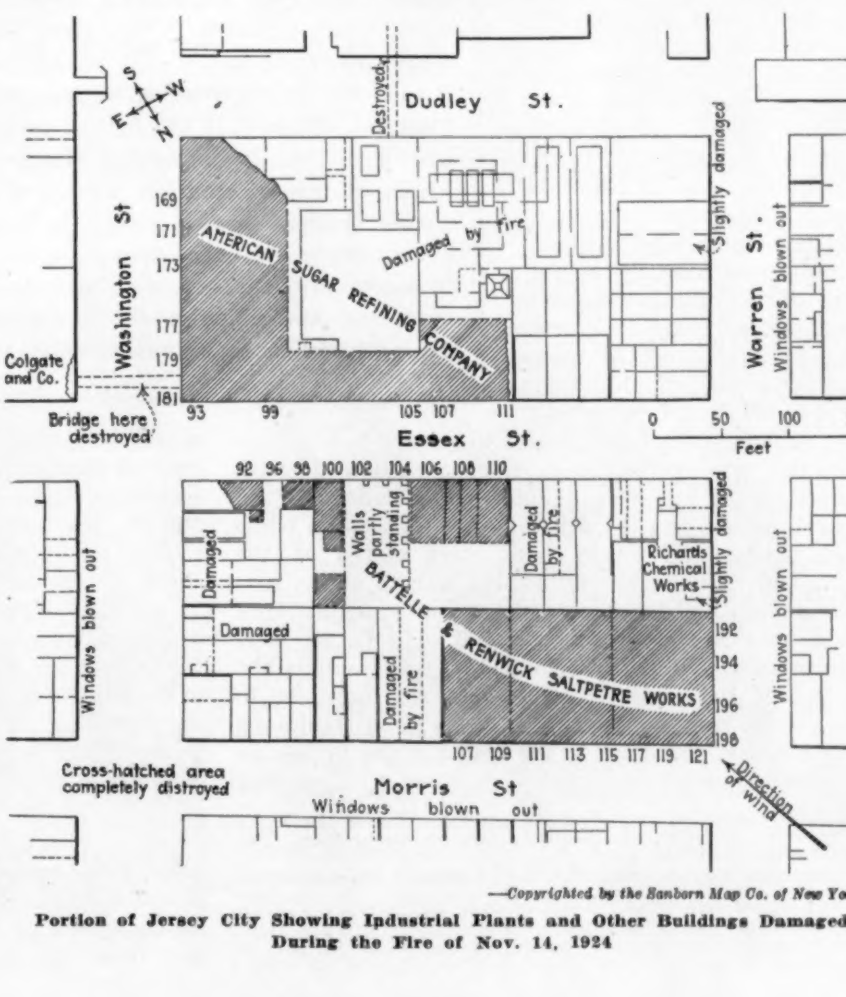
As the firemen attempted to stem the tide of the flame in the Battelle & Renwick property there was a series of minor explosions, doubtless caused by the water as it came in contact with the molten niter. These explosions were of sufficient force to break many windows in neighboring stores and homes and to scatter brick and other débris over several blocks.

The exact cause of the fire has not been determined to the satisfaction of all concerned. Employees of the company hold that burning newspapers from a bonfire started by school children on Morris St. were blown through the window gratings into the cellar of the building. The chief of the local fire department, who arrived at the fire at 9.05 and personally turned in the subsequent alarms, contends that the fire had its origin within the works, probably in the drying room.

The Battelle & Renwick company was engaged primarily in the manufacture of refined potassium nitrate. In addition to housing the equipment for manufacturing operations, the company's buildings were also used for storing the bags of crude sodium nitrate and the barrels of the refined potassium nitrate. The manufacturing processes employed were comparatively simple. The crude sodium nitrate was converted into potassium nitrate by boiling it in steam-heated kettles with a cencentrated solution of potassium chloride. The sodium chloride formed was then separated from the potassium nitrate by fractional crystallization in open crystallizing pans. After further recrystallization, the saltpeter crystals were dried, first in a centrifuge and then in the hot-air heated rotary drier. The dried product was ground, packed in barrels and stored until shipment.

Both the crude nitrate and the muriate of potash were received at the plant in bags. After the materials were dumped into the boiling kettles as needed, the bags from the niter were washed before being sold. The management claimed that no large number of unwashed bags were allowed to accumulate on the premises.

If there is a lesson to be learned from the Jersey City calamity it is not that there is an inherent danger in either sodium or potassium nitrates. Rather it is the handling and storage of these materials in contact with combustible matter that tends to create a fire hazard. It is apparent, therefore, that where possible the nitrates should be stored in bulk in concrete or other fireproof storage bins. Likewise manufacturing operations should be carried on without bringing the material into contact with wood or other combustible matter.



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Portion of Jersey City Showing Industrial Plants and Other Buildings Damaged During the Fire of Nov. 14, 1924

Famous Nitrate Fires of History

An Authentic Account of Some of the Great Industrial Conflagrations Involving the Nitrates of Sodium and Potassium

By Charles E. Munroe

Chairman of the Committee on Explosives Investigations, National Research Council, Washington, D. C.

IN RECENT publications[1] attention has been called to the behavior of ammonium nitrate in fires and the "fire hazard" from its presence due to its tendency to liberate oxygen, or nitrogen oxides, at moderate temperatures. These publications stimulated inquiries as to fires involving other nitrates, such as those of potassium and sodium, which commonly occur in commerce, but, with the exception of Dr. Hare's article résumêd below, extended search of the literature disclosed only brief, scattered references to these events. A search for accounts of them among those who handle and deal with these materials has therefore been made with the result that much valuable information has been generously placed at the writer's disposal.

Potassium Nitrate Fires

The most important publication on this subject appears to be the article by Dr. Robert Hare[2] entitled, "Memoir on the Explosiveness of Niter With a View to Elucidate Its Agency in the Tremendous Explosion of July, 1845, in New York." According to this account, a fire broke out in New York City in a five-story warehouse, with garret and cellar, on July 19, 1845, the course of which was attended by repeated small explosions and a final heavy explosion which caused the destruction of 230 houses, with a property loss of approximately $2,000,000, and many casualties, some fatal. Investigation showed that at the outbreak of the fire merchandise was stored on every floor, from cellar to garret, of the warehouse and that of this there was 347,207 lb. of India saltpeter, in bags, mixed indiscriminately with combustible materials such as madder, safflour, mustard seed, kindling wood, raw silk, indigo, sugar and coffee on the first, second and third floors of the building, while coffee, shellac and gunny bags were stored on the fourth and fifth floors and in the garret above, and sugar, indigo and lac dye in the cellar beneath, there having been in the warehouse 1,021,040 lb. of merchandise, of which at least 670,000 lb. was combustible. The last of the series of explosions was sufficient to demolish the warehouse, throw down seven buildings in the vicinity, and drive in the fronts of the houses on the opposite side of the street 87 ft. distant. This final explosion was accompanied by a large dazzling flame and the projection of incandescent masses, which spread the conflagration and even endangered the shipping a quarter of a mile away in the Hudson River. The effects were those of an explosion of a large quantity of gunpowder, but exhaustive investigation did not disclose that any gunpowder was present in the warehouse.

During this investigation attention was called to the destruction, on May 5, 1845, of the ship "Virginia," loaded with linseed and saltpeter, following a fire, for within 20 minutes after fire was discovered on board a tremendous explosion, accompanied by flame 200 ft. high, occurred, carrying away the main and mizzen masts and causing the vessel to sink at once.

> Nitrate is the veritable backbone of many industries—explosives, fertilizers, nitric and sulphuric acids, dyes and many other chemicals. It is not and should not be regarded as a hazardous material, although it has figured prominently in many industrial disasters. Much of the information presented so authoritatively in this article is being made public for the first time. It includes experiences that should prove of interest and value to all plants that deal with sodium and potassium nitrates.

Effect of Water on Fused Nitrate

In commenting on the New York disaster Dr. A. A. Hayes says: "The recent destruction of life and property in New York and the loss of a homeward-bound Indiaman and her cargo, by a similar cause, have created an anxiety which has led to many inquiries respecting the origin of the explosions attending the burning of saltpeter. I need not remind you of a case that occurred at Central Wharf (Boston) about 10 years since, when the Hartford packet was destroyed. The testimony obtained in the last instance led me to make some experiments on the effects produced by dropping water on a burning mixture of saltpeter and charcoal. It was ascertained that a very small weight of water, relatively to the saltpeter, caused explosions, which might be made successive, so long as the material remained. The quantities of the substances acting being increased to between 100 to 200 lb., the addition of water, in the form of spray, caused an explosion which destroyed the vessel and shook all the buildings in the vicinity," and he adds, "I do not hesitate in expressing my belief that the disastrous effects produced in New York were caused by water or other fluid falling on saltpeter, while burning in the bags investing it. . . . The danger of throwing water on the fire is manifest, while the loss to the owner of the saltpeter would doubtless be greater from water than from fire."

Effect of Impact

Dr. Hare accepted Dr. Hayes' opinion as to the effect of water on fused niter mixed with combustibles, which he confirmed by observation and experiment, but he also found by experiment that mixtures such as salt-

Adapted from a paper prepared for presentation to the Third Pan-American Scientific Congress, meeting at Lima, Peru, Dec. 20, 1924, Jan. 20, 1925.

[1] "Ammonium Nitrate (NH_4NO_3)," by A. M. Schoen, Southeastern Underwriters Association, Jan. 13, 1922 and "The Explosibility of Ammonium Nitrate," by Charles E. Munroe, *Chem. & Met.*, vol. 26, pp. 535-542, March 22, 1922.

[2] "Smithsonian Contributions to Knowledge," Vol. II, Art. 7, 1851, 19 pp.

peter and charcoal, which when heated usually deflagrate, would, when struck a heavy blow, explode. He points out that the fused niter set fire to the floors and the fire, by eating through, allowed the residue of the contents to fall below, and he found the last and greatest of the series of explosions, which he estimated to be equal in effect to that produced by 60,000 lb. of gunpowder, to be due to such an impact on the heated mixture accumulated, probably, in the cellar.

This record is of special interest in that Dr. Hare seems to have been one of the first, if not the first, to recognize the important fact that an increase in the temperature of an explosive increases its sensitiveness to impact, and further in that we find here the explanation of the practice of posting warning notices on cars and warehouses in which nitrates are stored to the effect *"In Case of Fire, Keep Water Away!"*

Sodium Nitrate Fires

Sodium nitrate is the nitrate that appears in commerce in the largest quantity, is the most widely distributed and, from these standpoints, offers the greatest fire hazard. In seeking evidence from experience as to the magnitude of this hazard, the writer has inquired of those directing or supervising the explosives, fertilizer and strictly chemical industries, those engaged in transportation and storage and those associated with the insuring of these enterprises. Through the courtesy of the chief of the Bureau of Ordnance, U. S. N., he has been supplied with copies of the official reports on the two following nitrate fires, with permission to make use of them in publication:

Sulphuric Acid Causes Fire

Fire occurred at the Naval Proving Ground, Indian Head, Md., on Nov. 15, 1901, in the nitric acid factory building, a two-story concrete building with slate roof, and with wooden beams, rafters, window frames, sashes, doors and stairway. The lower story contained the retorts, with their equipment, for the production of HNO_3 from $NaNO_3$ by the action of H_2SO_4 upon it. The upper story was used for the storage and handling of the $NaNO_3$, but there was also placed on this floor a 500-gal. distributing tank used for supplying H_2SO_4 to the retorts in the lower story. This tank was provided with a manhole in its top and it was filled, by air pressure, from storage tanks outside the building, through a pipe leading from them. This distributing tank was also provided with a drip pan and drain to take care of overflow.

At the time of the fire there was 250,000 lb. of $NaNO_3$ in jute bags stored, piled on dunnage, on this upper floor and there was a large number of empty unwashed bags piled outside but near the building. It being necessary to fill the distributing tank, the attendant proceeded to do this by opening the inlet valve; then, going outside the building, he opened the pressure valve on the storage tank, and allowed the filling to go on unsupervised, with the result that the overflow from the distributing tank was greater than the drip pan and drain beneath it could carry off, so that H_2SO_4 ran out on to the floor where the $NaNO_3$ was stored and by contact decomposed the $NaNO_3$ and caused the jute and dunnage to ignite. The employees, being called to fire quarters, proceeded to throw sand through the windows and doors upon the fire and had all but succeeded in quenching it when the pile of bagging outside the building caught fire and drove them away. The fire totally destroyed the roof and the wooden portions of the building and badly damaged the soda crusher, trolley, elevator and scales, the motors and starting boxes and the countershafting. The bags enveloping the $NaNO_3$ and about 20,000 lb. of the nitrate were consumed, leaving the remainder fused in a mass, but fit for use.

Figs. 1 and 2—"Nitrate Craters"

After the fire at the Old Hickory Ordnance Depot all of the wooden posts in the nitrate building were so completely destroyed that it was difficult to find any trace of them. Yet where each post stood there was a large circular hole, 20 in. in diameter, extending down through the piles of nitrate. The outer surfaces of each hole were incrusted with hard, lava-like material (doubtless sodium carbonate) resulting from the reaction of the wood with the residue from the nitrate of soda.

Fire Due to Short-Circuit

A second fire occurred in a niter storehouse at this station on June 19, 1904, which at first was supposed due to spontaneous combustion, largely because of the high temperatures prevailing for several days prior to its outbreak, but also because of the hour of the outbreak and because close inspection and sampling of the niter at the time of receipt and frequent inspections of the storehouse up to the day before the fire had disclosed nothing abnormal. But subsequent circumstantial evidence indicated the fire had been caused by a short-circuiting of a trolley wire that was attached to the building.

This niter storehouse was located about 100 ft. from the nitric acid factory, with which it was connected by a trestle bridge. The building was built of light scantlings with corrugated iron sides and roof and wooden floor, and the rails from the trolley line entered the building. On June 19 there was in the building 905,423 lb. of $NaNO_3$ in hemp bags of about 300 lb. each, stored in tiers from eight to twelve sacks high, resting on the floor and rails, with an air space of about 4 ft. between the bags and the door. A trolley line circuit breaker in the power house blew out about

Molten nitrate, like lava, flowed down from the great storage piles and formed a hard crust over much of the surrounding territory.

When the galvanized iron sides were removed, these great piles were revealed. Note how every niter bag has been burned away; in fact, everything combustible has disappeared.

Figs. 3, 4 and 5—After the Destruction at Old Hickory

12.05 a.m., a cloud of smoke was observed issuing from the niter storehouse about 12.10 and the fire was soon marked. The fire was attacked with sand and dirt and special efforts made to prevent its spreading. It was intensely fierce and became a molten stream that was arrested with difficulty. Though the building collapsed immediately, the fire was not got under control until 4:30 a.m., but by 7 a.m. it was extinguished except for the sporadic eruption of caked masses.

Through the further courtesy of the Chief of Ordnance, U. S. A., I am permitted to publish the following abstract from the Annual Report of Operation of the Old Hickory Powder Plant and Ordnance Reserve Depot for 1921.

Fire Caused by Lightning

In June, 1921, there was 67,000 tons of nitrate of soda stored at the Old Hickory Depot in nine buildings, all of which consisted of wooden floors resting on wooden sills, with side walls of galvanized iron supported on wooden posts, and wooden roofs, covered with two-ply tar paper, supported by wooden trusses resting on wooden piers running the entire length of the buildings. The sodium nitrate was stored in burlap bags and had been stored there since 1918.

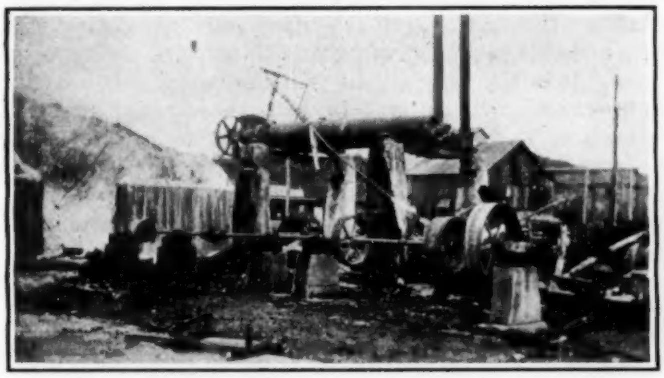
About 3:30 p.m., on June 23, 1921, a terrific rain storm, amounting almost to a cloud-burst, set in, accompanied by lightning and thunder. From the best information available, lightning struck Nitrate Building No. 6 at 3:35 p.m., and a very few minutes afterward smoke was observed pouring from this building. The wind was blowing from the northwest and it appeared that the building was struck at or near the northwest extremity. The smoke was of a peculiar brownish gray color which became denser and blacker within possibly 30 minutes. The odor of nitrogen oxides was noticeable in the brownish yellow fumes and was even more apparent in the heavier, blacker fumes. It was extremely difficult to breathe when in this smoke.

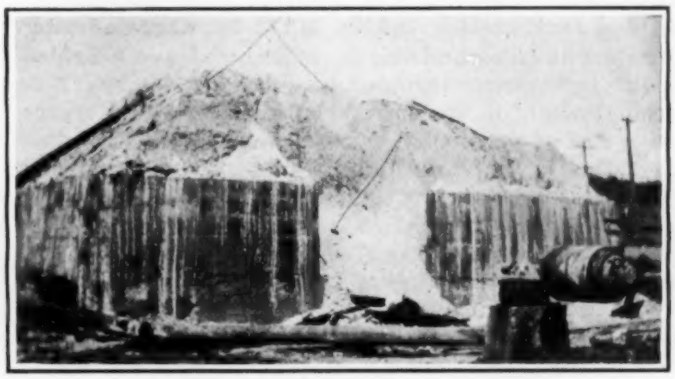
It is well known that sodium nitrate will not burn and that there can be no fire unless it is associated with some combustible substance. The burlap bags in which the sodium nitrate was packed and the wooden posts, trusses and side posts that supported the galvanized-iron sides of the building and the roof supplied the combustible material required to cause this rather unusual fire. Figs. 1 and 2 show some of the anomalous results of this fire.

While the fire was in progress it was noted that wherever molten sodium nitrate came in contact with wood the combustion was increased very considerably and that flames, which in intensity resembled those of an oxy-acetylene welding torch, shot out. This probably accounts for the rapidity with which the fire spread through the building. It is believed that the lightning that struck this building set fire to the wooden portions thereof, that the heat generated by the burning wood melted some of the sodium nitrate and that this molten nitrate, coming in contact with the burning wood, increased the intensity of the fire and heat because of the oxygen, or nitrogen oxides, evolved from it.

No effort was made by the fire department to put out this fire by means of water or chemicals, because it was realized that still more harm would be done in washing away nitrate of soda in a heated condition. The rain filled the ditch surrounding this building very rapidly. The melted sodium nitrate flowed off into the water-filled ditch, where it bubbled, boiled and exploded and ultimately formed a crust, not unlike lava, all around the building. This is shown in Figs. 3, 4 and 5.

The next day, June 24, the fire had abated to such an extent as to render it possible to make a superficial examination of the pile. It was then noted that all the timbers around the sides of the building and the posts supporting the roof had been burned almost to extinction. Some of the roof trusses, however, were still burning on top of the pile. Parts of them had fallen into the holes made by the burned-out roof supports, and wherever this was the case a severe fire was in





Figs. 6 and 7—What Remained of the Soda Drying and Storage Houses After the Fire at the Pluto Plant of the Hercules Powder Co.

The building in which the sodium nitrate was dried stood in the foreground of the picture at the left, a portion of the drying machinery remaining in place. Behind the soda dry house is the remains of a boiler house. Fig. 7 shows the soda storage house minus its roof and elevating equipment. It will be observed how the molten niter had poured out through the doorway.

progress. An examination of several of these holes showed some material, evidently sodium nitrate, bubbling and boiling, and where it came in contact with the wood, every now and then a fierce flame shot forth not unlike, in color and intensity, the flame of an oxy-acetylene welding torch, except of course that it was much larger.

The fire department was ordered to remove all this charred and burning wood from the top of the pile, and it was then estimated, from the volume of nitrate of soda remaining, that the quantity in the building had been reduced approximately 6,000 tons. This loss was due to: (*a*) Reaction with burning wood and bagging, (*b*) washing away by water falling on it, (*c*) flowing away in the molten condition into the water-filled ditches.

Each of the lumps of sodium nitrate was surrounded by a crust varying in thickness from ⅛ to 1 in. The lumps were irregular in size and this is believed to be due to wood having fallen on some of the masses and destroyed part of the nitrate of soda therein.

The opinion is expressed in this report that if this sodium nitrate had not been stored in bags on a wooden floor in a building having a wooden framework and wooden supports for the roof, together with wooden trusses supporting the roof, no fire would have occurred, and it was held that a fireproof building of either concrete or hollow tile construction in which the nitrate of soda was stowed in bulk would be preferable.

Hercules Fire at Pluto Plant

On July 26, 1921, a fire occurred in the soda dry and soda store house at the Pluto plant of the Hercules Powder Co., Ishpeming, Mich., due to a series of explosions in the explosives area of this plant. Approximately 740,000 lb. of $NaNO_3$ was involved, of which 286,000 lb. was subsequently reclaimed and used. Only where combustible matter fell against the pile of niter was there any real combustion, but much of the material was fused from prevailing fires and run off. The writer is indebted to E. W. Symmes, of the Hercules company, for an account of this event and for photographs, Figs. 6 and 7, showing the results of the fire.

It is a marked characteristic of nitrate of soda to "cake" and in time to assume a stonelike hardness. This may occur in the storehouse or in the vessel or railway car in which it is being stored or transported, and the mass, even when stored in bags, becomes so hard that blasting is resorted to for breaking it up. Fred Olsen, of Picatinny Arsenal, reports a fire, "due to blasting a solid mass in the storage room," the fire seeming "to consist of exceedingly rapid combustion of the bags in which the sodium nitrate was contained and also of timbers which comprised the framework or floors of the building."

Fires in Transportation

As sodium nitrate is extensively used in many industries[9] and in agriculture throughout the United States and, since it is entirely of foreign origin, it enters largely into transportation, being water borne from Chile and distributed over this country chiefly by rail. It was expected that much information might be obtained from the records of marine underwriters, but this expectation was not realized. However, General Uhler (supervising inspector-general, Steamboat Inspection Service), kindly supplied copies of his records from 1914 to 1921, showing three fires of this kind—namely, the vessel "Foxton Hall," with a full cargo of niter, developed a fire in her coal bunker Sept. 23, 1914, off Watling's Island, W. I., and became a total loss. The "Pennsylvania," lying off Iquique, Chile, Nov. 12, 1918, loading with niter, developed a fire in No. 3 hatch and became a total loss. Cause found was "spontaneous combustion." And the "Brookland," lying in Havana, Cuba, harbor discharging niter Feb. 6, 1920, developed fire in No. 1 hold and was flooded and sank. Cause found was "spontaneous combustion."

Through the courtesy of Governor Jay J. Morrow, under date of Aug. 1, 1922, I am informed that up to that time but a single fire had been reported in nitrate cargoes on vessels using the Panama Canal while in canal waters. This occurred on Jan. 19, 1921, on the British steamship "Azeus" while lying near Dock No. 15, Balboa, with 5,900 tons of nitrate in burlap bags on board. The fire was discovered in nitrate stored in lower No. 4 hold. The smoke emitted was very dense, of a grayish color and very irritating to the eyes, throat and nose. The flames were reddish and relatively cool. The fire worked through a small hole in the steel bulkhead into No. 5 hold and burned for between 7 and 8 hours. Though water was used, there was but one explosion, due, it was thought, to "fumes" accumulated in No. 5 hold before the hatch covers were

[9]The writer in a study of the statistics of the U. S. Census of 1905 found that the manufacture of explosives consumed 39.8 per cent of the country's consumption of nitrate of soda; nitric acid 19.9, compounded fertilizers 13.6, general chemicals 12.2, sulphuric acid 7.2, glass 4.6, potassium nitrate 2.5 and dyestuffs 0.1 per cent. (See *J. Ind. Eng. Chem.*, 1909, vol. 1, pp. 297-299). Curtis (*Chem. & Met.*, 1924, vol. 30, pp. 788-90) reported that in 1919 of a total of 695,187 tons, mixed fertilizers consumed 130,683, explosives 174,742, chemical industries 78,810, acid for fertilizer manufacture 21,732, miscellaneous uses 12,404, the remainder of 276,816 tons being used directly as fertilizer.

removed. The loss of $80,000 to the cargo was held largely due to the solution of the nitrate in the water used in the efforts to extinguish the fire.

Chem. & Met. (vol. 27, p. 324) reports the destruction of a niter-laden lighter in Erie Basin, New York City, on Aug. 11, 1922. Fire broke out on this lighter while it was taking cargo from the U. S. Shipping Board freighter "West Jaffrey." After unsuccessful efforts to extinguish it by water, the lighter was abandoned and an explosion occurred that sank it.

In the matter of statistics of transportation we are more fortunate in having access to the reports of Colonel B. W. Dunn, chief inspector of the Bureau of Explosives of the American Railway Association, whose office was opened on June 10, 1907. A survey of the bureau's records shows that twenty-five nitrate fires, causing a loss of $1,565,121, occurred in rail transportation between 1907 and 1924. The greater part of this loss ($1,500,000) was assigned to a single fire that occurred on Aug. 3, 1908, in a "dock-house" in Chicago in which 720,000 lb. (3,600 bags) of niter was stored. The probable cause assigned was a lighted match or cigarette thrown among the bags of niter. A comparison of the extent of loss in this single instance with that of the twenty-four others emphasizes the fact that this is determined largely by circumstance and environment.

Analyses of these reports show the fires to have been found due to sparks from the locomotive, live coals dropped on the track, hot boxes, leakage of bags so that nitrate became mixed with organic matter on the floor of the car, or about or around the freight house, and in the case where a fire occurred in a car which was "tight" and in good condition but which had been subjected to frequent and excessive shifting, it was "believed that friction or rubbing of the bags against the nitrate of soda was responsible for a fire that broke out 40 minutes after the drawbar had been pulled out" in an attempt to start the stalled train.

Most of these alleged causes may be eliminated by making sure the niter is stored in clean, sealed-tight cars, and preferably steel cars. But this would not eliminate "friction," alleged in the last-mentioned case and which I found suspected by others. Thus one correspondent of much experience wrote: "Regarding jute soda, we believe it is quite possible that rubbing surfaces in a car in motion could generate heat enough to ignite the impregnated jute bags if the latter were dry, since the jute under such conditions is practically tinder." Another correspondent, in a works using niter on a very large scale, reports they "had forbidden their laborers to draw the bags along on surfaces for fear that the friction might set the niter-impregnated jute on fire."

This seemed worthy of experimental inquiry and at the writer's request the subject was exhaustively investigated by J. E. Crawshaw, explosives engineer, Bureau of Mines Experiment Station, Pittsburgh. Limited space for this presentation precludes the publication of his results except for the following:

(*a*) From these tests it is evident that jute impregnated with sodium nitrate is very difficult to ignite by friction, and liability to ignition by friction is in the following order: (1) Inside of a bag from which the sodium nitrate has been emptied; (2) outside of a bag from which the sodium nitrate has been emptied; (3) jute bag impregnated by soaking in saturated solution of sodium nitrate; (4) washed jute bag.

(*b*) The presence of both linseed oil and lard oil decreased the liability to ignition by friction.

(*c*) The increased sensitiveness in liability to ignition of the bags from which the sodium nitrate has been emptied over the bags which have been impregnated by soaking in a saturated solution of sodium nitrate is probably due to the presence of the adhering crystals, which causes an increase of concentration of sodium nitrate locally, with increased friction.

(*d*) The difference in sensitiveness between the inside and the outside of a bag from which the sodium nitrate had been emptied may be due to moisture present. While both sides of the bag were quite dry, the inside of the bag usually is a little drier than the outside.

(*e*) The difficulty of obtaining ignition is well illustrated in one test where sufficient heat was developed to char so thoroughly the portion of the test piece under the revolving disk that the material dropped out and broke up, without any sign of flame.

Bag Fires

In the account of the fire at Indian Head, on Nov. 15, 1901, previously described, it appears that the ignition of a pile of niter bags outside the building was an essential factor in enlarging the extent of the conflagration and a serious impediment in fighting the fire, and this factor is emphasized in most of the reports cited. It is also pointed out that the bagging is heavily impregnated with niter. In fact, the amount present is such as to make its recovery profitable, as shown in a recent British Government report.[4] At this bag-washing plant 86 tons of niter was recovered from 199,075 bags, or 0.97 lb. per bag. As the estimated niter content was 1.2 lb., the loss was 19.0 per cent. Attention is also called to the additional importance of bag washing "as a means of diminishing the fire risk from bags impregnated with niter, since several serious fires occurred from sparks alighting on unwashed niter bags."

Two unpublished reports of spontaneous ignition of niter bags have been received from reliable sources. In one case the unwashed bags were piled in a wash tank without water. The weather being cold, steam was turned on the coil to prevent freezing, and eventually the bags ignited from this exposure. In the other case, during hot weather, a cart loaded with unwashed bags was detained, exposed to the sun for some time, while an accounting was being made. Eventually the bags burst into flames, and the cart and horses were destroyed. In addition, I have a communication from C. A. Taylor, explosives chemist, Bureau of Mines, in which he says:

> The only nitrate fire I ever had was one that started by spontaneous combustion. We had emptied several carloads of sodium nitrate and piled the empty bags in the bag wash house but, through the rush of other work, neglected to wash them. It was in the hot summer and they fired. There wasn't enough nitrate to make it dangerous to turn the water on, but the bags were so impregnated that they burned rapidly. Some of the bags might have been greasy or might have contained other foreign material from dirty cars in shipment, but the fire started in the daytime with men in an adjoining building close enough so they were able to note just where the fire started.

From a review of the matter presented it is evident that the nitrates treated of, and especially sodium nitrate, present no fire hazard when by themselves and that to retain this security they should be stored and transported out of contact with combustible materials.

In addition to those already named, the writer desires to express his appreciation of assistance rendered by S. P. Howell, A. M. Schoen and Captain R. B. Munroe.

[4]"Washing Niter Bags," pages 66-68 of "Manufacture of Nitric Acid From Niter and Sulphuric Acid," Technical Records of Explosives Supply, 1915-1918, British Ministry of Munitions, etc.

Cyanides and Chemical Engineering

Du Pont Engineers Have Worked Out a Process for Producing Cyanides by Nitrogen Fixation That Is a Splendid Example of First-Class Chemical Engineering Development

By H. G. Chickering
Chemical Engineer, du Pont Company

FROM the commercial standpoint, cyanogen probably reached its peak of importance just prior to and during the World War, owing to its value as a nitrogen-bearing compound, and the eyes of many anxious investigators were turned toward the cyanides and cyanamides during those years for a means of fixing our nitrogen requirements. It was such a motive which prompted the du Pont company in 1918 to investigate intensively the subject of sodium cyanide from a nitrogen-fixation standpoint, for the production of ammonia and nitric acid, both of which are used to a great extent in the manufacture of explosives. While it was realized that during normal times any cyanide process would probably be unable to compete with other synthetic processes for the production of ammonia, the importance of a method for the manufacture of a high-grade cyanide and the many important chemical compounds which may be produced from such a raw material was recognized.

A literature and patent search resulted in a decision to investigate the production of sodium cyanide in a manner represented by the following equation:

$$Na_2CO_3 + 4C + N_2 = 2NaCN + 3CO$$

Briefly stated, the du Pont process for making cyanide consists in heating a mixture of soda ash, carbon and catalyzers to approximately 975 deg. C. in gas-fired retorts with nitrogen passing through the mass under a pressure of 15 lb. to the sq.in. gage. The product from the retorts is leached with water to form a saturated cyanide solution, from which sodium cyanide is crystallized in pure form, the undissolved residue containing the catalyzers being used to make up the next furnace charge and the mother liquor from the crystallizing operation being used for further leaching. The cyanide crystals are dehydrated in hydraulic presses, which discharge the anhydrous cyanide in cakes of convenient form.

Experimental Development

In our earlier experimental work emphasis was laid on a study of the influence of various catalyzers on the rate and manner of nitrogen fixation, a determination of the proper proportions of the three ingredients that constitute a retort charge, and a study of the optimum conditions of temperature and pressure in the retort. The experimental retort is shown in Fig. 1.

FINDING A CATALYST

Up to this time ground metallurgical coke had been used as a source of carbon with the addition of finely divided iron as a catalyst. A great many auxiliary catalysts were used along with the iron, of which alkali halides were found to be the best. It was ultimately found that the use of iron oxide together with an alkali halide—such, for instance, as sodium fluoride—mixed with soda ash and ground coke, increased the conversion from about 50–55 per cent to about 70 per cent in four-sevenths of the original time. The results of this small scale experimental work are shown in Table I, from which it will be noted that when no catalyzer is used a 45 per cent conversion was obtained in 7 hours as compared with a conversion of 70 per cent in 4 hours, when a catalyzer consisting of ferric oxide and sodium fluoride was used. The charges used at this time consisted of approximately 40 per cent C, 40 per cent Na_2CO_3, 15 per cent Fe_2O_3 and 5 per cent NaF, first powdered finely and afterward thoroughly mixed.

In this process the question of retort pressures is important and it was definitely shown by a series of experiments that 15 lb. per sq.in. gage pressure represented the optimum pressure conditions—that is to say, that a pressure of 15 lb. per sq.in. gave an effect as good as pressures up to 50 lb. and a better effect than pressures of a lower degree.

A CHEAP NITROGEN SUPPLY

It was next determined that pure nitrogen was entirely unnecessary in this process. With producer gas as the source of nitrogen, substantially the same amount of cyanide is formed in a given time and at the usual temperature, provided two important precautions are observed:

(*a*) The producer gas must have a minimum CO_2 content (not more than 6 per cent by volume), and
(*b*) Any cooling down of the cyanized charge in the presence of producer gas must be avoided.

Carbon dioxide destroys cyanide rapidly even at high temperatures, and consequently the producer gas used must contain a minimum amount of this impurity. Likewise, the cyanized charges cannot be cooled in an atmosphere of producer gas, because, although the equilibrium $2CO \longleftrightarrow C + CO_2$ gives almost pure CO above 900 deg. C., at 500 to 600 deg. C. it is almost completely reversed.

AND AN INEXPENSIVE CARBON

The use of metallurgical coke in this process has its disadvantages, which are principally due to its high ash-content and low activity. Several other forms of carbon were investigated with a view to obtaining a source of pure active carbon that would not be prohibitive as regards cost. The search led ultimately to the finding of such a material in the carbon produced as a little used byproduct in the preparation of wood pulp for the manufacture of paper by the soda process.[1]

[1]In this process, wood chips are digested with caustic soda solution, and thus pulped. The exhausted caustic solution is separated from the pulp, and evaporated to form "black liquor," a concentrated caustic solution carrying partly carbonized wood particles and partly decomposed resinous compounds dissolved from the pulped wood. The soda pulp manufacturer recovers the soda from this black liquor by incineration and leaching. Soda ash solution and a pure, finely divided carbon byproduct are thus produced. The soda ash is causticized with lime for re-use in the pulping operation.

This material is represented by the following typical analysis:

	Per Cent		Per Cent
Soda ash	2.5	Volatile matter....	30
Water insoluble ash	2.5	Fixed carbon......	65

This byproduct carbon when substituted for metallurgical coke in charges otherwise of the same composition and furnaced under the same conditions gave:

(*a*) A substantial increase in the conversion of soda ash to cyanide.

(*b*) An average of from 40 to 45 per cent cyanide in the furnace product as against a previous average of 35 per cent.

(*c*) A shortening of the time required for the economically complete cyanide reaction of from 4 hours to 2 hours, when oxide of iron and an alkali halide were used as catalyzers.

The only disadvantage encountered with the use of this form of carbon was due to its very finely divided state and its low density. It was found impossible

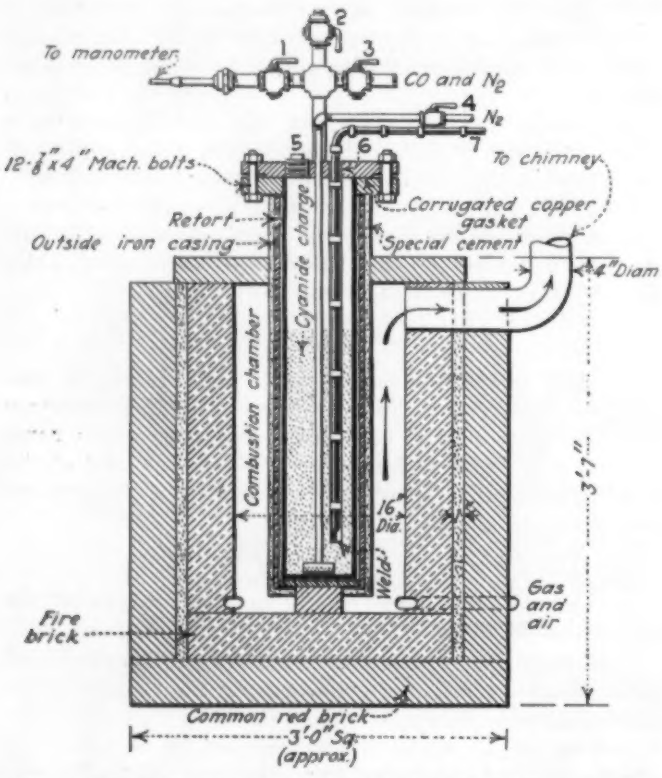
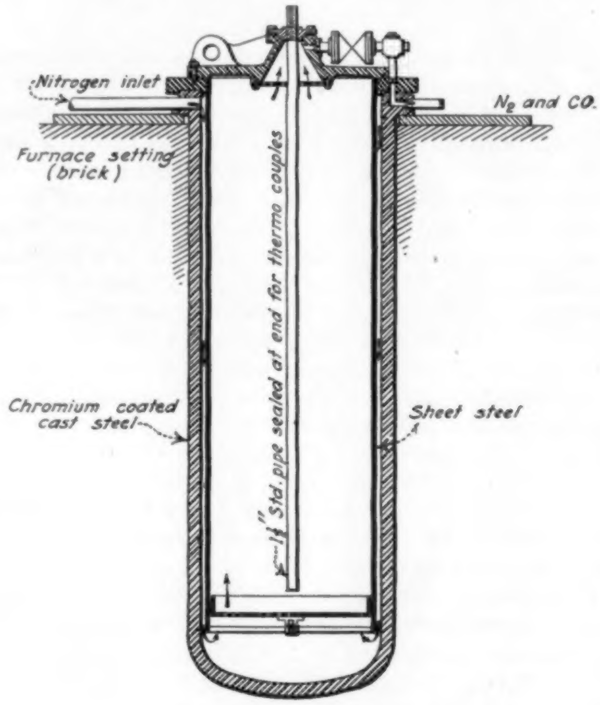


Fig. 1—Small Experimental Retort Used in Early Experiments

It consists of an iron retort capable of withstanding a pressure of 15 lb. per sq.in. gage, at temperatures ranging from 900 to 1,100 deg. C. It has a flanged head provided with means for introducing nitrogen, as at 4, ending in a distributor shown at the lower portion of the retort; a charging hole with plug 5, for introducing the charge; and an outlet pipe for the escape of the gases given off in the reaction, this pipe being so arranged as to accommodate a manometer and a valve for sampling. The retort was fitted with the usual pyrometer pocket 6, and thermocouple 7, for controlling the temperature of the operation. The retort proper was set within an outside iron casing, which was covered with fireclay cement to protect it from oxidation by the gases of the combustion chamber. The capacity of this experimental unit was about 30 lb. of charged material.

to keep it from being blown from the powdered charge out of the retort when once the current of producer gas was admitted. It was, therefore, necessary to incorporate the charge in a wet mixer, adding sufficient water to hydrate the sodium carbonate present. The mass after being allowed to harden was granulated in a corning mill, the fines being screened out and returned to the wet mixer.

The next major chemical development pertained to the substitution of "black liquor" for commercial soda ash and the byproduct carbon just described. The black liquor used in all our work, which was obtained direct from a paper pulp manufacturer, is the liquor resulting from the evaporation of the caustic soda solution with which the wood is cooked. It is a black, viscous liquid with a specific gravity of about 35 deg. Bé. and contains excess caustic soda from the digestion of wood chips to dissolve ligneous and resinous matter, together with compounds resulting from the reaction



Retort Finally Developed

between these constituents of wood and the surplus of caustic soda present. A typical analysis of black liquor as obtained from a pulp mill follows:

	Per Cent
Soda ash (potential)........................	23.0
Fixed carbon	13.5
Water and carbonaceous material, vo'atile at 250 C. (mostly water)	56.0
Carbonaceous material, volatile at 300 deg. C...	7.0
Ash	.5

Investigation showed that if, instead of incinerating the black liquor by the usual method, through which the black ash becomes heated to a high temperature, the black liquor be evaporated to dryness at low temperatures and the residue heated out of contact with air, practically complete thermal decomposition of the organic compounds takes place at temperatures between 250 and 350 deg. C. There resulted an extremely porous mass containing 60 to 65 per cent soda ash and 40

Table I—Illustration of Improvement in Conversion

Small Experimental Retorts Operated at 950°-1,000° C.

Charge	Conversion (Per Cent Theoretical)	Time Hours	Per Cent NaCN in Product
Soda ash and coking coal........	45	7	..
Soda ash, coke and iron.........	55	6	25
Soda ash, coke, iron and alkali halides	70	4	35
As above with substitution of byproduct carbon for coke......	75	2	40–45
As above with substitution of black liquor for soda ash and byproduct carbon	90	1$\frac{1}{2}$	50–55

to 35 per cent carbon (a large part of the carbon being in colloidal condition), entirely suitable as a source of soda ash and largely fulfilling the carbon requirements for a cyanizing charge.

It was definitely demonstrated that charges prepared by using black liquor, augmented by the addition of byproduct carbon, would produce a product containing 50 to 55 per cent NaCN in 70 per cent of the furnacing time previously required. (See Table I.)

The Step-Up to Commercial Units

By this time the process had reached a point in its development where it was deemed advisable to consider commercial-size units. One of our first decisions pertaining to plant-scale operation was to discard the "continuous feed" retort principle in favor of the "batch process" method. This decision was largely influenced by considerations of equipment cost, together with our knowledge from the past experience of others that very great difficulty would be faced in feeding semi-molten cyanide charges continuously through a heat zone raised to the temperature for cynide reaction. Further, since it had been decided to use producer gas as our source of nitrogen, the fact that cyanide decomposition would result from cooling cyanide charges in producer gas made successful continuous-feed retort operation with producer gas seem very improbable.

Means devised for avoiding batch process disadvantages consisted in inclosing the charge in a light, sheet-iron container inserted in the retort proper, the retort remaining permanently in the furnace setting, which could be maintained at constant temperature. The charge-container, with its contents, at the end of the reaction period could then be easily removed and cooled in a suitable cooling chamber and a new container holding a raw charge could be immediately inserted in the permanently fixed heavy retort.

The design of retort as finally developed is shown in Fig. 2, and the following advantages in operation are obtained:

(*a*) Batch charges can be furnaced on much the same time schedule as if the charges were fed through the retort continuously, the principal difference being the interval of time required for removing, by means of a crane, a finished charge and inserting another envelope containing a new charge.

(*b*) The retorts proper are maintained constantly at the operating temperature, thus avoiding troubles due to their alternate heating and cooling.

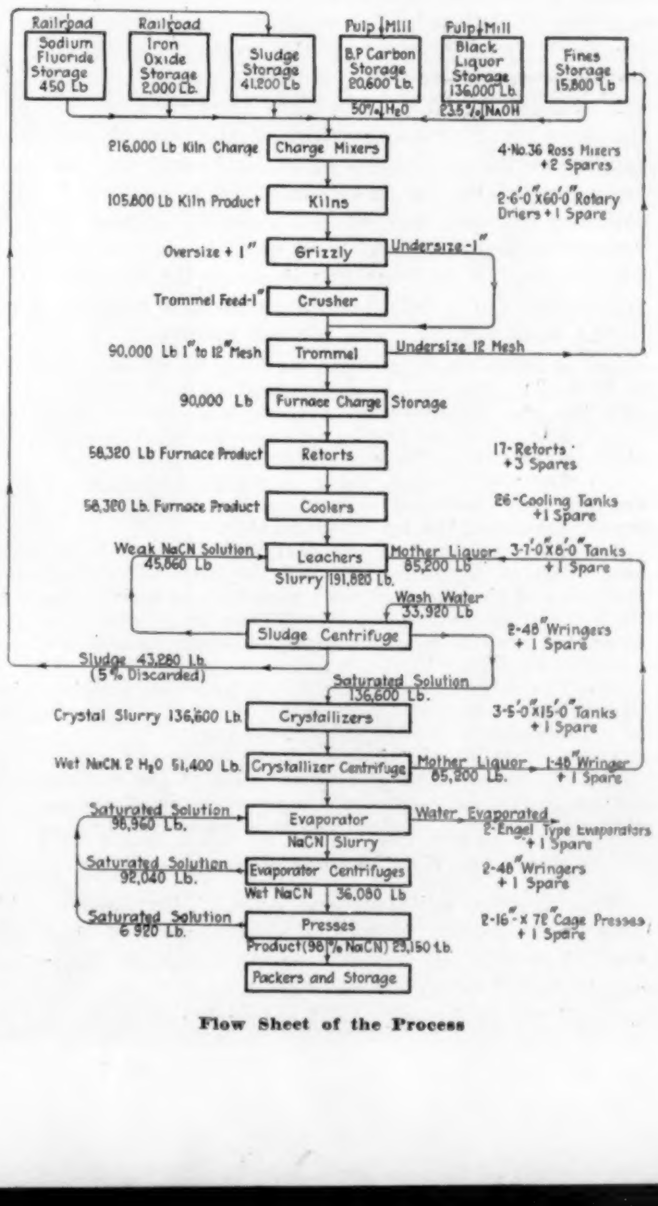
(*c*) The nitrogen in its passage down from the top of the heated annular chamber formed between the inside walls of the retort and the envelope containing the charge becomes preheated to the reaction temperature when it reaches the perforations admitting it to the charge, thus heating the charge internally. This means of heating the charge tends to flatten out the temperature gradient between the walls and center of the retort charge.

A great deal of attention was given to the subject of retort protection, which eventually led to the development of an entirely new process for the production of heat and oxidation resistant castings, known as "chromium-coated castings." Such castings are made by coating the molds with ferrochrome in such a manner as to form a high chrome-iron alloy on the outside surface of the iron or steel castings when the metal is poured. The subject of chromium-coated castings, while of importance in connection with any process that involves furnace oxidation problems, is too extensive to receive more than brief mention here. Fortunately there are several very good oxidation-resisting materials on the market at this time which can be successfully used in this cyanide process.

Increasing Retort Capacity

Another important operating detail developed at this time resulted from observations of the physical condition of retort charges at different stages of the cyanide reaction. It was found that shrinkage in the volume of the charge began to take place soon after reaction started and that this shrinkage amounted to about one-half the original volume of the charge after the reaction was one-fourth completed. Therefore advantage was taken of this phenomenon by adding more material to the retort at the end of this shrinkage period. In this simple manner 50 per cent additional product of the same cyanide content was obtained with the expenditure of less than half an hour of added time, including that required for interruption of the operation and for introducing the augmenting charge.

It is a surprising fact, as disclosed by a literature search, that previous investigators had always used retorts of relatively small diameter. It has been shown conclusively that the rate of cyanide formation is directly proportional to the rate at which heat reaches the charge when once the charge has been brought up to temperature. Using vertical cylindrical retorts varying from 8 to 24 in. in diameter, it was further discovered that the heat is transmitted through the charge so largely and so rapidly by radiation that the rate



Flow Sheet of the Process

of transmission depends principally upon the ratio of heat-transfer surface in the retort walls to the volume of the charge. The effect of this discovery is illustrated by the following comparison of cylindrical retorts of 8 and 24 in. diameter, respectively:

8 in. diam. retort:

$$\frac{25\text{ in. circumference}}{50\text{ sq.in. area}} = \frac{25\text{ sq.in. heat-transfer surface}}{50\text{ cu.in. charge}} = \frac{1}{2} = 0.5$$

24 in. retort:

$$\frac{75\text{ in. circumference}}{450\text{ sq.in. area}}\text{ or }\frac{75\text{ sq.in. heat-transfer surface}}{450\text{ cu.in. charge}} = \frac{1}{6} = 0.166$$

The rate of heat transmission and consequently of cyanide formation in an 8 in. diameter retort is therefore roughly 0.5 as compared with 0.166 in a 24 in. diameter retort. This means that while a 24-in. retort will consume $0.5 \div 0.166$, or three times as much time for reaction, approximately $450 \div 50$, or nine times as much product can be handled. On the basis of such considerations, it was decided to employ retorts about 36 in. in diameter by 12 ft. long, set vertically.

The Leaching Process

The final and to a large extent the most noteworthy achievement in the chemical development of this process consisted in devising a method for extracting technically pure cyanide from the retort charges by aqueous leaching. That this was possible was evident from a thorough investigation of the mutual solubilities of sodium cyanide, sodium carbonate, sodium hydroxide and sodium fluoride. The data thus obtained showed the strongly depressing effect of the cyanide and hydroxide on the solubilities of the carbonate and fluoride, and resulted in the development of a method for recovering 96 per cent of the cyanide in the furnace product as a material of from 96 to 98 per cent purity. The success of this method depends largely upon the maintenance of a definite small hydroxide concentration in the leach liquors. The method involves:

(a) Simple, countercurrent leaching to saturation at 35 to 40 deg. C., followed by crystallization at 8 to 12 deg. C., with the production of 98+ per cent pure $NaCN.2H_2O$.

(b) The use of mother liquor from the crystallizing operation in further leaching operations.

(c) The use of wash water in the leaching operation in amount only sufficient to replace the water removed by crystallization of the hydrated cyanide.

(d) The "melting" of the $NaCN.2H_2O$ crystals in their own water of crystallization in a "salting-out" evaporator, operating in closed circuit with a centrifuge which separates the anhydrous cyanide deposited in the evaporator from the saturated cyanide solution simultaneously formed, and returns this solution to the evaporator.

(e) The dehydration of the wet anhydrous cyanide under hydraulic pressure at 45 to 50 deg. C. with the production of cyanide cakes of 96 to 98 per cent purity.

(f) The return of the press liquor to the evaporator.

(g) The prevention of accumulation of the very soluble sodium hydroxide in the leach liquors by transforming it to carbonate through treatment with sodium bicarbonate.

The Present Process

This process in its present state of development differs considerably from the simple process first described in this article. We now find our raw materials consisting of soda pulp mill "black liquor" and "byproduct carbon" as the sources of soda ash and carbon, while producer gas is used as a source of nitrogen. The use of these materials, while constituting great advantages as regards conversions, yields, operating costs, etc., complicates the process somewhat so far as equipment and, therefore, investment costs are concerned. There is included in this paper a flow sheet of which detailed explanation does not appear necessary. It is perhaps sufficient briefly to enumerate the important steps of the process as now developed.

The retort charge, consisting of the raw materials mentioned above, together with sludge recovered from the leaching operation and "make-up" iron oxide and sodium fluoride, is fed into charge mixers, whence it flows by gravity to rotary driers fired with producer gas. Here the water and volatile hydrocarbons are eliminated, the product emerging as a comparatively light porous solid. It is then crushed, screened and elevated to storage bins, from which it may be fed by gravity to the retort charge containers. The screen undersize is fed back into the charge mixers.

No further description of the retort operation seems necessary, except to state that the carbon monoxide gas resulting from the reaction is mixed with an additional quantity of producer gas and then burned under the retorts to supply the necessary heat for the reaction. After cyanization, which requires about 13 hours, the charge containers are removed by an overhead traveling crane and cooled in cooling cans until the temperature has been reduced to about 100 deg. C. The material is then dumped on to a conveyor leading to the storage bins, the container is recharged and the operation repeated.

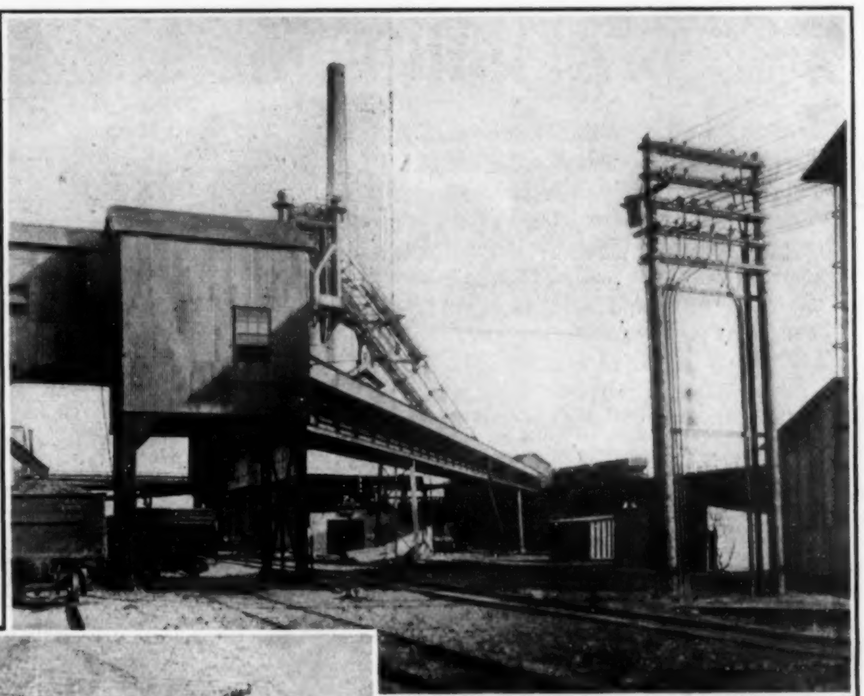
No detailed description of the leaching plant will be given. It is equipped with the requisite number of tanks, evaporators, crystallizers, centrifuges, presses, etc., all of this equipment being of standard make, easily obtainable.

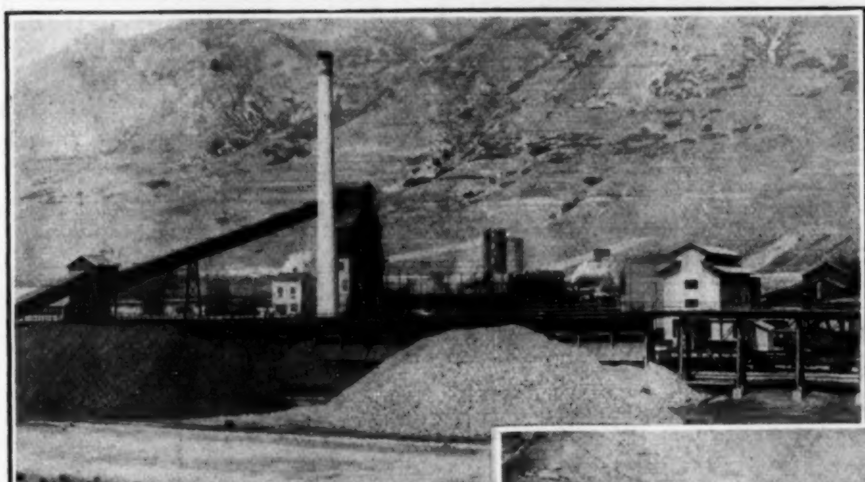
In conclusion, I wish very briefly to mention one matter that will undoubtedly have a very important bearing on the success of this process. I refer to the use of the residual carbon in the leached furnace product as a decolorizing carbon and as a pigment. Realizing the strong probability that the "black liquor" carbon should represent an excellent raw material for the preparation of a decolorizing carbon and that its discolorizing qualities should be enhanced by its passage through the cyanizing reaction, a considerable amount of preliminary experimental work was undertaken to determine its value in this respect. Results thus far obtained indicate that a good decolorizing char can be prepared, and also that a carbon black may be obtained of a quality at least equal to that of a medium-grade black for pigment use. For this purpose about 1 lb. of carbon can be recovered for every 3 lb. of cyanide made. The influence which this phase of the subject has upon the cost of cyanide is, for obvious reasons, extremely important.

Cement Mills Burn Oil

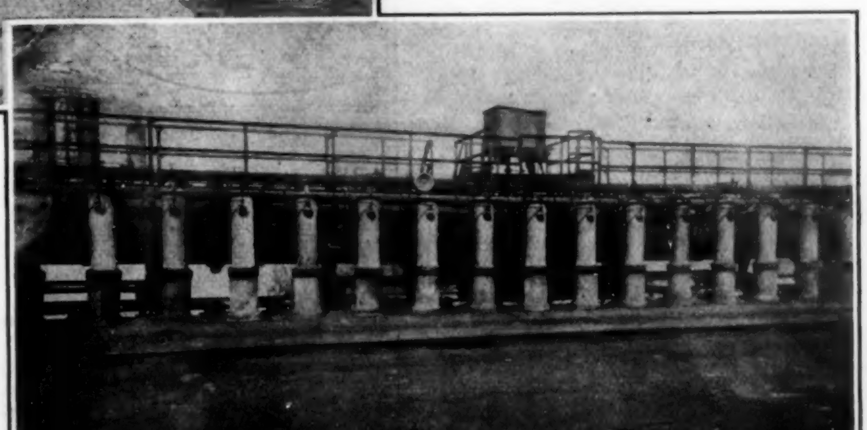
Portland cement mills last year consumed 4,700,000 bbl. of fuel oil, according to the U. S. Geological Survey. The survey reports a total of 126 plants in the country, of which 18 burned oil, 107 coal and 1 gas. In 1922, 17 plants burned oil. Last year the plants used 30,000,000 lb. of lubricants, as against 25,000,000 lb. the year before.

It Is Economical to Coke Even Low-Grade Utah Coal





THE new byproduct oven plant of the Columbia Steel Co. at Provo, Utah, consists of thirty-three ovens of the Becker type built by The Koppers Co. This plant is operating successfully with 100 per cent Utah coal for making a metallurgical coke. This development is of particular interest, because Utah coal has usually been regarded as of a grade unsatisfactory for metallurgical coke production. Certainly such coal would ordinarily not find market at a byproduct oven in the middle or eastern section of the country. The economic conditions in the territory which the new plant serves are such as to make use of a nearby lower-grade coal advantageous, because of the lower freight rate for its delivery to the plant, despite the somewhat lower yield of byproducts and furnace coke.



The pictures hardly need an explanation. At the top is the loading and unloading equipment and below it is a view of a coke-oven battery from the discharge side. Just above—This picture is a general view of the plant, with a glimpse of the rugged terrain. To the right—Gas exit pipes leading from the individual ovens to the large gas main behind them.

(RIGHT) General view of kilns for burning C-22 brick. In the right background is a No. 11 mill for powdered Celite and on the hill to the left are employees' houses.

A unique deposit consisting of the siliceous residue from minute vegetable diatoms that thrived for thousands of years in the warm seas of the Miocene era is the basis for this material. Now the deposit is 400 ft. above sea level in California and is being successfully and intelligently utilized by the Celite Products Co.

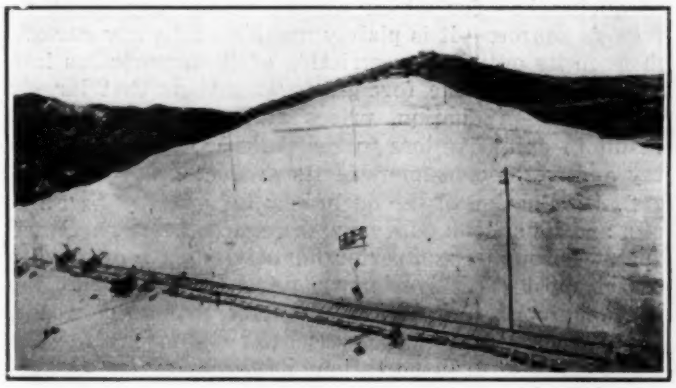
(ABOVE) General view of operations.

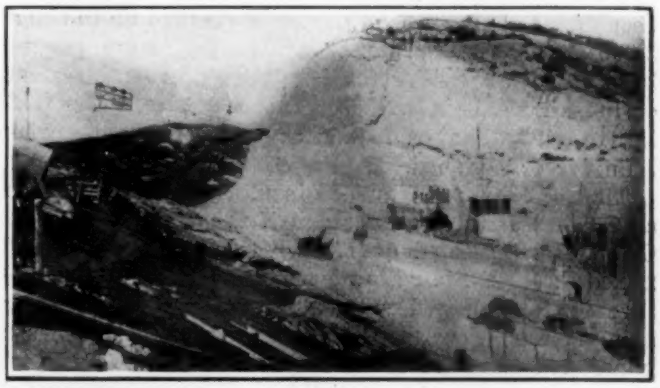
(RIGHT) The mill for powdered Celite products, showing heat-treating kilns under construction in foreground.

A Heat Insulator and Filter Aid

A HUNDRED and sixty miles west and north of Los Angeles and within 10 miles of the Pacific shore is located a most unusual industry. Whitehills, Calif., is the name of the community maintained by the Celite Products Co. The property and plant cover more than 2,200 acres and more than 2,000 persons are connected directly and indirectly with the operations of this industry.

The property embraces thick and extensive beds of hydrated amorphous silica resulting from the precipitation of plankton marine diatoms during the Miocene era. The formation is a stratified sedimentary deposit resulting from the accumulation of these diatoms over immense geologic periods of time. While originally formed under the surface of the sea, the saucer-shaped deposit is now about 400 ft. above sea level. It is estimated that the deposit is about 1,400 ft. deep in places, and a careful survey indicates that more than 33,000,000 tons of the mineral product is available.





Quarry Floors for Insulating Brick

Two specially designed machines for cutting brick at left. Right-hand picture shows overhead carriers for transporting brick to driers

The primitive plant organisms that make up the enormous beds are so small that 1 cu.ft. of raw mineral contains more than 40 billion individual cells, each cell the remains of a single organism. Each cellular unit is hollow and many of the cells are of the most intricate shape. This minute porosity, together with its peculiar shape, is the secret of the value of this mineral as an insulator of heat and as a filter aid in numerous filtration processes.

The immensity of the deposit makes it possible to separate the reserves into several classifications, having minor characteristic differences. Intensive study of the composition of various parts of the deposit has made it possible to select the best grade of material for each industrial purpose. This is possible because of scientific control, and applies not only to production operations but also to the industrial uses of the materials produced and marketed.

The Celite Products organization history dates from 1912, but prior to that time the deposit had been worked in a small way by early operators. In fact, the first tunnel was driven 25 years ago at the northern boundary of the present property. The initiative represented at that time by two determined pioneers with picks and shovels augmented by "one-mule" transportation has developed into an industry requiring a connected load of more than 2,500 hp.

The plant property and equipment includes more than 200 buildings and more than 5 acres of warehouse space. About 20 miles of roadway is maintained and 8 miles of telephone wires is required to connect the various units of the property. Twenty miles of high tension lines distribute electric power to the various quarries and mills and a water supply has been provided for domestic and manufacturing purposes as well as to provide against fire. Railroad sidings have been provided to accommodate more than one hundred freight cars.

The products manufactured are of two principal forms—namely, powder and brick. In powdered form the mineral has many uses: for heat insulation (alone or combined with other products); as a filter aid; as a lightweight mineral filler, and as a delicate abrasive. For manufacture into powdered form, the crude material, containing from 30 to 60 per cent moisture, must be dried before pulverization and classification is possible. The screening of this product, which has an apparent density of 0.12, is difficult, because most of it is finer than the finest screen available. Air separation, however, makes possible a careful separation of particle sizes.

Some idea of the nature of this light, bulky substance can be obtained from the fact that 12 cu.ft. of loose powder is compressed into a 5-cu.ft. bag in the packing operation.

One of the most interesting types of material produced is a coarsely ground calcined grade known as C-3. This product is used for lining furnace and oven doors and in the bases of kilns, hot blast stoves, marine boilers, etc. The coarse mixture, known as C-3, is incorporated with a small amount of portland cement and saturated with water. This mixture is then rammed into place and sets up as a strong monolithic structure of light weight and high insulating value. C-3 is produced by burning the raw mineral in lump form in a vertical shaft kiln. This kiln is actually built within a hill of Celite rock. It is undoubtedly the best insulated kiln in the world, its thinnest wall being 50 ft. or more of solid Celite.

Two definite types of insulating brick are produced. The first is cut from selected strata of the natural mineral. The brick are cut "in place" in the quarry bank by unique cutting machines developed by company engineers. The brick are then dried in tunnel driers,

machined to accurate size and shape and packed in fiber cartons for shipment.

In some cases as much as 40 ft. of overburden must be removed in order to expose a floor suited to the cutting of these brick. Something like 9 tons of mineral "rock" is excavated or transported for every ton of finished Celite produced.

This natural type of insulating brick has an extremely low thermal conductivity, less than one-tenth the conductivity of ordinary firebrick inch for inch. The standard size insulating brick (9x4½x2½ in.) weighs approximately 1¾ lb. In spite of the light weight its crushing strength is more than 28 tons per sq.ft., and it will withstand direct heat of 1,600 deg. F., a higher temperature than is possible with any other effective heat insulator.

Burned Insulating Brick

There are two kinds of burned insulating brick. One is produced by burning the natural brick after they have been cut to shape. It diminishes shrinkage up to about 2,000 deg. F and produces a stronger, more rugged brick, used largely for the insulation of rotary cement or limekilns. This brick has a special size, 9x4½x4¼x3 in., to give 3 in. of insulation between the firebrick lining and steel shell.

The second type of burned insulating brick is known as C-22. For the manufacture of this product the raw Celite from selected quarries is milled, screened and mixed in a definite ratio of coarse and fine. The mixture is then pugged with water and pressed. After being molded, they are dried and burned in down-draft kilns. All kilns are oil-fired and thoroughly insulated. The manufacture of burned C-22 brick requires careful control of moisture, pressure in molding, and burning temperatures. This type of insulating brick has no measurable shrinkage up to direct heat of 2,000 deg. F. and is quite free from spalling or checking under rapid temperature changes.

The company has maintained its own research organization almost from the start of its operations. Its work of the laboratory has been devoted to two major types of activity. The first has been the use of Celite as a filter aid to facilitate the filtration of various liquids such as sugar liquors, sirups, fruit juices, vegetable oils, animal oils, chemicals, sewage, etc., and the second has been the physical tests on heat-insulating materials.

Block Tin Specifications

Contamination of distilled water by improper storage or piping is a common cause of difficulty in laboratory and plant. The National Bureau of Standards has been very successful in avoiding this difficulty in its chemistry building by use of block tin-lined tanks, block tin piping and block tin cocks with silver plugs.

However, the tin must be of very high quality; other metals commonly alloyed with the tin cause rapid water contamination. Suggested specifications for block tin for distilled water lines: Lead, not more than 0.02 to 0.03 per cent; iron, not more than 0.02 to 0.03 per cent; copper, not more than 0.02 to 0.03 per cent.

Lead and iron are thought to be more harmful than the copper—that is, copper might be up to 0.05 without causing trouble. The bureau has purchased several lots that met the above limits, showing that the specification is a practical one.

Foreign Quebracho Monopoly Merits Consideration by Tanners

Monopolistic control of quebracho abroad behooves the United States—the largest manufacturer of leather and the chief consumer of the extract—to take steps to protect itself against unfair exactions. That resort should be had to chemistry in an effort to devise substitutes and that American interests should co-operate to meet the situation is clearly deducible from a report on the subject just issued by the Department of Commerce. The bulletin on quebracho, which is by H. M. Hoar, is the third of a series issued in connection with a survey of tanning materials.

Conclusions of the Survey

The general conclusions reached as a result of this survey are as follows:

1. Inasmuch as the United States is the world's largest producer of leather and its greatest consumer of quebracho—for which we are wholly dependent on foreign sources—it is plainly manifest that any curtailment in its output or restriction of its importation into this country by the foreign organizations that largely control its production, prices and distribution would result in extensive loss to the American leather industry and to the consumers of its products.

2. Domination of the quebracho industry by La Forestal and its subsidiaries may be regarded as an accepted fact. Through its superior financial status, ownership of the most extensive known stands of quebracho, the best equipped and largest capacity plants, railroads, river steamers and other essential equipment for the facilitation of transportation, it is in position to substantially lessen if not entirely eliminate competition. Thus, it is enabled to fix prices, thereby adding unnecessarily large sums to the cost of leather, which eventually must be paid by the consumer.

3. The ability of American tanners to cope with the conditions set forth in this report and at the same time maintain their present supremacy in the leather industry involves on their part a most intelligent scrutiny of the present and future adequacy of tanning materials, with possible improvements in their use, and the urgency of aiding and encouraging American leather chemists in developing new substitutes, with their proper utilization through scientific research.

4. Since the question of foreign control of important tannins is bound to be a live issue to the United States tanning industry, it is obviously advisable that American interests should make all proper efforts to secure ownership of quebracho sources or long-time contracts for this essential raw material, with a view to procuring and maintaining such a hold as would guarantee future adequate supplies. Exceptional importance should be attached to the outlook for this industry as being significant of what may be expected in the near future for foreign tannages as a whole. Their efforts could also be profitably directed to the question of wattle cultivation in the United States, its territories and adjacent countries, where there is a possibility of its being successfully produced, as shown in Trade Information Bulletin 211.

Finally, it is apparent from a study of the subject that concerted action on the part of the leather interests of this country is essential if the problems relating to adequate and unfailing supplies of tannages are to be solved and the future of the leather industry in the United States rendered secure.

Vapor Phase Refining of Gasoline

First Large-Scale Plant to Use the Gray Catalytic Process Shows Some Interesting Results as Compared With Sulphuric-Acid Refining

By Donald M. Liddell
Weld & Liddell, Consulting Engineers and Economists, New York City

THE importance of gasoline production from cracked distillates has recently been commented on editorially by *Chem. & Met.* (Nov. 10, 1924), and, as is there stated, the adequacy of the present supply of gasoline is dependent on cracking processes. It is estimated that approximately one-third of our present gasoline supply is derived from cracked distillates, and so far as any one can see, this percentage will continually increase. This dependence on cracking has already led to some complications in gasoline refining. These complications will increase as more oil is cracked and as a higher percentage of the crude oil is decomposed.

Many straight-run gasolines—that is, those produced by simple fractional distillation of crude petroleum—can be used as motor fuels without further refining. Most if not all of the gasolines produced by cracking will turn yellow or brown after standing, even if they come over water white on the original distillation, and will have a more or less disagreeable odor and will deposit some gum or resin. The color and odor may not be serious matters, although they offend the senses of the purchaser, and must invariably raise the question as to what impurities or dirt may be concealed by this off color. The deposition of gum is, however, a serious consideration, as small feed pipes or carburetors will be choked or will function poorly if there is such a deposit.

In order to prevent the formation of these deposits and to lessen the tendency of the product to go off color, refiners have resorted to acid refining of their gasoline. In this process a first distillate (mainly gasoline) is washed with sulphuric acid, then with water, then with an alkali solution, then again with water, and then the product is distilled. Sometimes the whole cycle of the process is repeated. The agitator is a familiar sight in all refinery landscapes, and the smell of sludge acid and the fumes from the acid recovery plants are among the most objectionable features of oil refining.

The cause of the untreated gasoline going off color and depositing insoluble residues is usually ascribed to diolefines. These are removed by the acid treatment, but so are many other compounds which not only do not cause any trouble but are among the most valuable constituents of the gasoline in that they are in the fraction of lowest boiling point. In addition to the sulphonation and removal of these compounds, there is also a polymerization of some of the light hydrocarbons, causing re-formation of products of high boiling point, which polymers have to be recracked. That is, if we take a crude gasoline of end point 437 deg. F. produced by cracking and treat it with acid, the product will no longer have an end point of 437 deg., but probably 4 to 5 per cent will have a higher end point—that is, be fit only for gas oil.

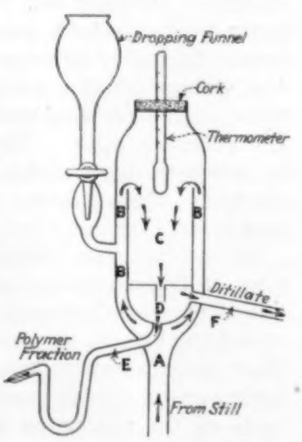


Fig. 1 — The Experimental Tower for the Catalytic Treatment of Pressure Distillate in the Vapor Phase

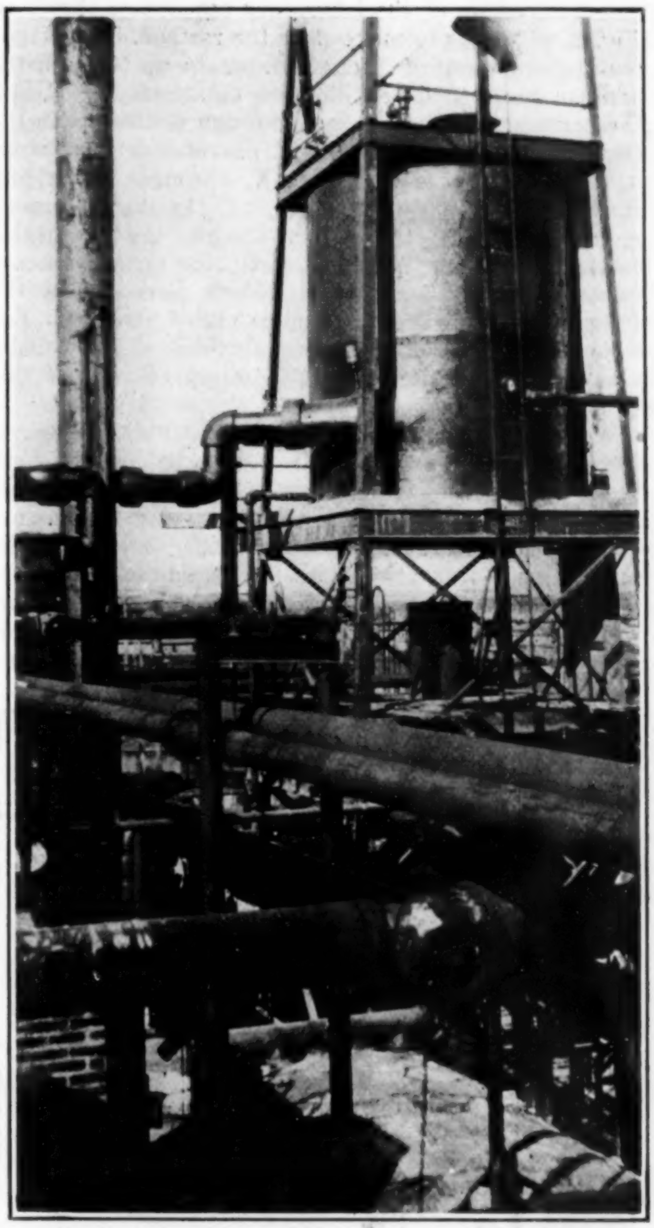


Fig. 2—The First Commercial Tower Installed at the Plant of the Barnsdall Refining Corporation, Barnsdall, Okla.

This tower contains 8 tons of the catalyst, which is ordinary fullers earth. It has a capacity for refining from 800 to 3,200 bbl. of gasoline without recharging. The tangential vapor introduction pipe may be seen at the left of the tower.

Recently the writer was employed to investigate a catalytic gasoline-refining process that seems to present striking advantages over the usual acid-refining methods, both as to cheapness of direct operation and as to cutting down on both direct and polymer losses in the refining process.

In 1913, Thomas T. Gray noticed that if gasoline vapors were brought into contact with fullers earth the tendency of this gasoline to develop color and to deposit gum was thereby removed. A patent was granted on this process in 1920 (U. S. Pat. 1,340,889), but it was not until 1923 that the translation from a laboratory process to a successful works process was accomplished.

A description of the laboratory apparatus, shown in Fig. 1, will serve to make clear the method. The vapor comes from the still through *A*, passes up through the annular space *B* surrounding the catalyst space *C*, and thereby warms it; goes down through *C*, filled with the catalyst, into a lower space *D*, provided with a vapor outlet *F* and a lower outlet *E*, through which any condensed liquids can be drawn off. In the laboratory apparatus, as in the works towers, the preferable catalyst is found to be fullers earth, and for convenience in operating, a plug of steel wool is placed below the fullers earth and another plug is placed above it. For laboratory work a fractionating column is usually placed between the still and the Gray tower, but this is not essential.

When the vapors from a cracked distillate are passed through an experimental glass tower, the fullers earth begins to blacken and apparently to grow moist, this blackening gradually working down through the column of fullers earth until it reaches the bottom of the catalyst space. At this time the liquid condensing in the bottom of space *D*, which heretofore has been colorless, now assumes a deep yellow to orange-red color. All the work done seems to indicate that this is due to polymerization of the diolefines only, and that the other light products polymerized by sulphuric-acid treatment are not polymerized when in the vapor phase.

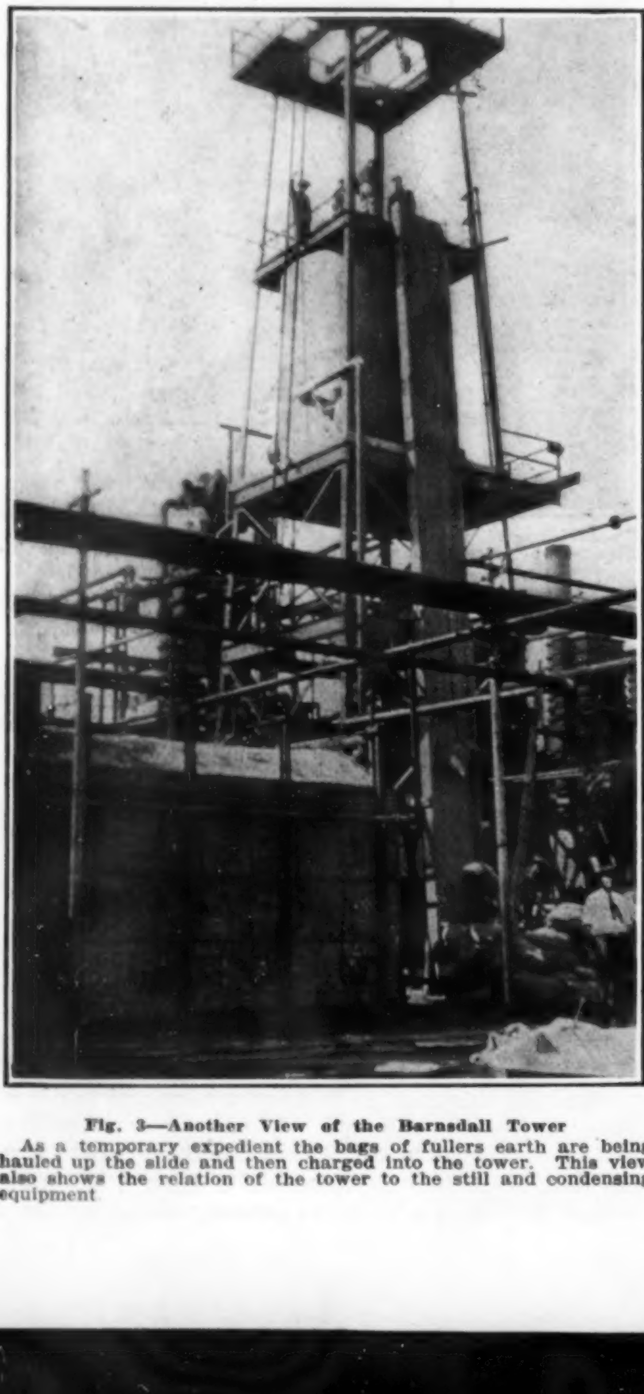


Fig. 3—Another View of the Barnsdall Tower
As a temporary expedient the bags of fullers earth are being hauled up the slide and then charged into the tower. This view also shows the relation of the tower to the still and condensing equipment

In short, this yellow-red color of a small portion of the condensate is due to the production, in a few seconds, of the compounds that otherwise form in the gasoline during a period of long standing and that tend to color it or to form gums. It may be objected that if this is true, the Gray process also has its polymerization losses. So it has, but while they may run 4 to 5 per cent in acid treatment, they do not exceed ½ to ¾ per cent in the Gray process.

Polymers Have Interesting Possibilities

This colored polymer fraction is an interesting one. There is, of course, more than the ½ to ¾ per cent of the colored fraction condensed, but if this be redistilled, all that passes off below 437 deg. F. is water white, while none of the intensely colored compounds distill at less than over 100 deg. above this point. In experimental work and so far in practice this colored polymer fraction is returned to the still, with entire confidence that none of the colored bodies formed will redistill with the gasoline. Whether it will be advantageous always to do this is a question still to be solved. The true polymer fraction, when isolated, has some drying properties, and when enough becomes available through large-scale work, it will be thoroughly investigated.

The blackening of the fullers earth already spoken of is by some compounds analogous to gums and resins, and they eventually poison the catalyst. They can be removed by some solvents, or, more simply still, by burning the earth, a process familiar to all oil refinery operatives. Ordinarily 100 to 400 bbl. of gasoline can be catalytically refined per ton of fullers earth.

While the earth in a glass tower looks moist, when the distillation is complete the earth can be poured out and appears simply as a dry black sand.

The process also has possibilities for kerosene refining. The sulphur is not greatly affected by this process. but kerosenes catalytically treated in the vapor phase give very good long-time burning tests, even when containing an amount of sulphur that would be most objectionable in an acid-treated kerosene. The writer is of the opinion, therefore, that natural sulphur in kerosenes has a different effect on the flame than has sulphur introduced from, or in form altered by chemical treatment.

The process is amazingly simple. From the laboratory tests the writer inferred that in a good pressure distillate there would be a direct saving of about 7 cents per barrel of gasoline in operating cost, an increase in the gasoline produced of about 8 per cent of the volume of the gasoline and of about 2 per cent more of the residual heavy hydrocarbons to go back to the pressure stills. These savings would be increased in working up certain poor pressure distillates, particularly those from certain vapor-phase cracking processes.

In the last few months a large tower, containing 8 tons of fullers earth, has been installed by the Barnsdall Refining Corporation at Barnsdall, Okla. It is understood that the results on this tower are better than the laboratory tests of the writer as regards the hydrocarbon saving and approach very nearly his estimate on the saving on direct operating costs.

An acknowledgement is due Butler, Herrick & Marshall for permission to make use of information gained while making this investigation for them.

Legal Notes

By Wellington Gustin
Of the Chicago Bar

Protecting Fertilizer Makers Against Speculative Damage Claims

United States Supreme Court Upholds North Carolina Statute Requiring That Analysis Be Made Before Suit Can Be Brought

A statute in North Carolina, section 7, chapter 143, of the state laws, providing that no suit for damages to crops resulting from the use of fertilizer shall be brought, except after chemical analysis showing deficiency of ingredients, has been upheld by the Supreme Court of the United States. Its opinion decides the case of Jones versus the Union Guano Co., Inc., 44 Supreme Court Reporter, 280.

This action was brought by Richard M. Jones against the Guano company to recover damages alleged to have resulted to his tobacco crop from the use of fertilizer manufactured and sold by the company. Plaintiff failed to meet this requirement regarding chemical analysis and, notwithstanding evidence tending to show inferior quality of and deleterious ingredients in the fertilizer and injury to the crops resulting from its use, the court dismissed the case and entered judgment of nonsuit against Jones. The Supreme Court of North Carolina affirmed this decision, which in turn has been affirmed now by the U. S. Supreme Court.

The question presented to the U. S. Supreme Court was whether the state law so applied was repugnant to the Fourteenth Amendment to the Federal Constitution in denying to a citizen the equal protection of the law, and in denying one's rights without due process of law.

Fertilizer Blamed for Crop Inferiority

In his action Jones alleged the facts to be that he purchased 51 bags of fertilizer upon the representation and warranty of defendant that it was good for and conducive to the growth of tobacco. The weather was propitious, the plants were good and properly set out, and the land was properly tilled. The fertilizer contained deleterious ingredients not available as food for plants and killed or prevented the growth of tobacco. The tobacco produced was an inferior quality to normal crops and the crop was materially reduced in the number of pounds, showing a total loss of $5,037.50, which plaintiff alleged was due to the fertilizer.

The North Carolina Legislature dealt with the situation in 1917 by passing the act referred to, regulating fertilizers. Among other provisions, to prevent deception and fraud, it requires that before sale there shall be attached to each package a brand name, which is required to be registered with the state Department of Agriculture, the weight, the name and address of the manufacturer, and the guaranteed analysis, giving the percentage of valuable constituents—phosphoric acid, nitrogen (or equivalent in ammonia) and potash. Change of registered brand to a lower grade is forbidden. The use of the terms "high-grade" and "standard" is regulated, and minimum percentages of valuable constituents are prescribed for each grade. Deleterious substances are prohibited. Fertilizers offered for sale contrary to the provisions of the act are liable to be seized and condemned. Further, penalties are provided for violations of the act or if the regulations of the department made to effectuate the act.

Penalties for Deficiency

Whenever the Commissioner of Agriculture shall be satisfied that any fertilizer is 5 per cent below the guaranteed value in plant food, it is his duty to require that twice the value of the deficiency shall be made good by the manufacturer to one who has purchased such fertilizer for his own use. If 10 per cent below, then the rule is that three times this deficiency must be paid to the consumer. If the deficiency is due to intention of the manufacturer to defraud, then there shall be collected from him double the amounts above stated. If the manufacturer resists payment, the Commissioner is required to publish the analysis in an official bulletin and also in one or more newspapers. The department is required to have sufficient chemists and assistants and the necessary equipment to enable it promptly to make a report of the chemical analysis of all samples sent by purchasers or consumers. It is authorized to collect and analyze fertilizer offered for sale in the state. Samples for analysis are required to be taken from at least 10 per cent of the lot, but from not less than 10 bags of any lot or brand. Rules are made for safeguarding samples. No sample shall be taken after 30 days from actual delivery to the consumer, except by the state inspector.

The contention of counsel for plaintiff was that the statute arbitrarily substitutes the determination of an executive department for a judicial inquiry, and has the effect of abolishing all remedies against manufacturers of fertilizer for damages caused by the use of inferior or deleterious fertilizer, and is therefore repugnant to the Fourteenth Amendment to the Federal Constitution.

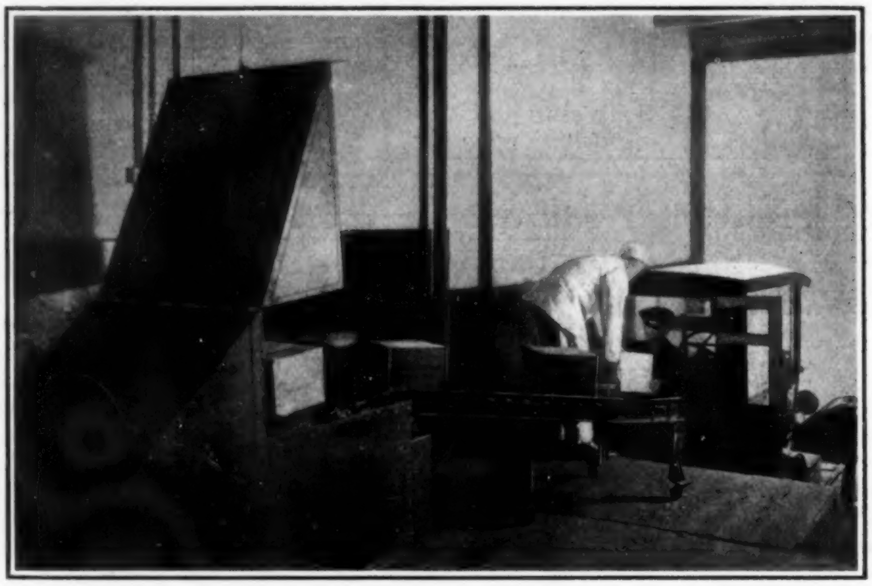
No Conflict With Constitution

Reviewing the facts involved, the Federal Supreme Court held that the act does not deprive purchasers of any right or cause of action. On the contrary, says the court, it gives additional rights and remedies to one who purchases for his own use fertilizer below the guaranteed value in plant food. The terms of the statute are not made exclusive. Under the act the parties were free to deal on other terms, says the court.

The requirement as to chemical analysis of fertilizers, etc., imposed by the statute the court held to be reasonable and well calculated to safeguard against uncertainty, conjecture and mistake. The analysis is not made conclusive. Other evidence may be introduced by either party. The determination of the department is not substituted for a new trial.

Referring to the Fourteenth Amendment of the Federal Constitution, the court says this does not prevent a state from prescribing a reasonable and appropriate condition precedent to the bringing of a suit of a specified kind or class so long as the basis of distinction is real, and the condition imposed has reasonable relation to a legitimate object. Actions to recover damages to crops resulting from the use of fertilizers may reasonably be distinguished from other damage suits, it says.

Where production and delivery can be synchronized, continuous conveyors such as the picture on the right shows are one of the best methods of taking goods to the shipping platform. The top of this inclined apron conveyor is the end of a conveying system that extends completely through this plant. The portable section of gravity conveyor can be used to deliver the goods for a truck as shown, while for a larger truck the gravity is removed, the hinged section of the platform swung back, and the truck loaded direct. When no truck is at hand, a stop at the bottom of the inclined conveyor permits the goods to accumulate. When the truck arrives the stop is removed and the truck is quickly loaded.

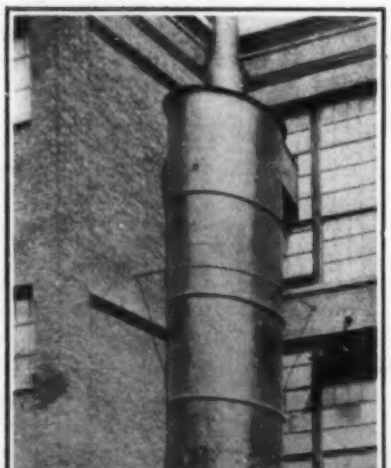
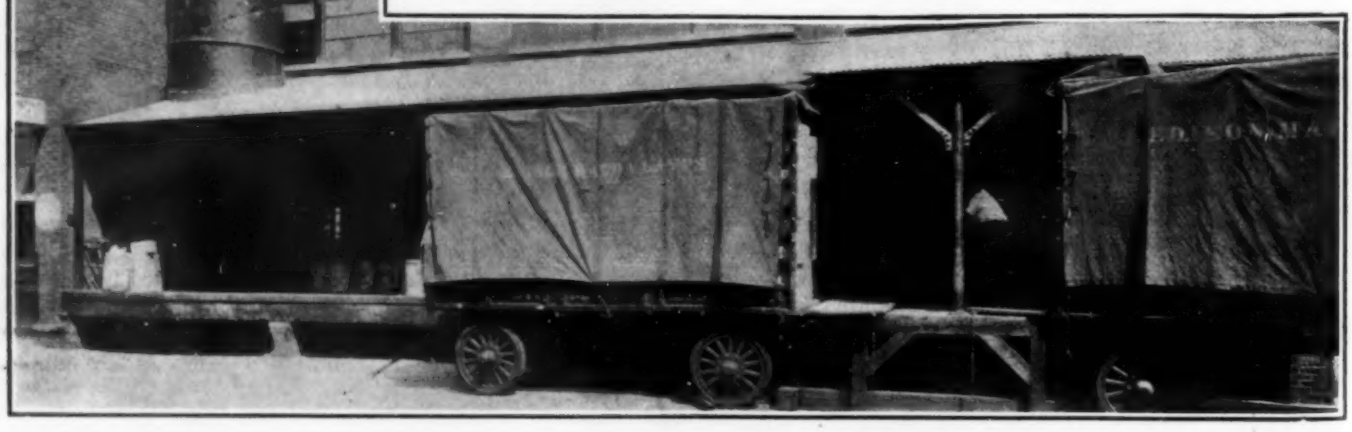


Shipping Room Methods Deserve Consideration

GETTING things out of the plant after they are made is sometimes as difficult as making them. The possible methods of performing this operation are legion; but some are, to say the least, much better than others. A few examples of these better methods shown here.

Heavy packages that are awkward to handle lend themselves particularly well to the lift truck and skid method of handling and storing. The skid platform shown in the picture above at left, loaded with drums of oil, is being taken from the storeroom to the loading platform. When the drums were empty, they were placed on the skids, with the filling tap on the upper end and then filled. The skid was then picked up by the lift truck and moved into the storage space, the filled drums being allowed to stand on the skid. Now that a car is to be loaded, the lift truck has again picked up the skid and is taking it into the car, leaving the skid there to be unloaded while it goes on to pick up another load.

One of the most efficient of modern methods for handling shipments for local delivery is shown in picture below. Cartons of glass lamp bulbs, packed in the shipping room on the top floor, are lowered to the shipping platform by the gravity spiral chute shown at the left, a method that eliminates breakage. At the shipping platform, these cartons are packed by hand into the trailer bodies, to be taken away as convenient by a gasoline or electric tractor. By this means the tractor is used to the utmost, the force of drivers is at a minimum, and there is no unnecessary waiting at the shipping platform due to truck delays.

Equipment News

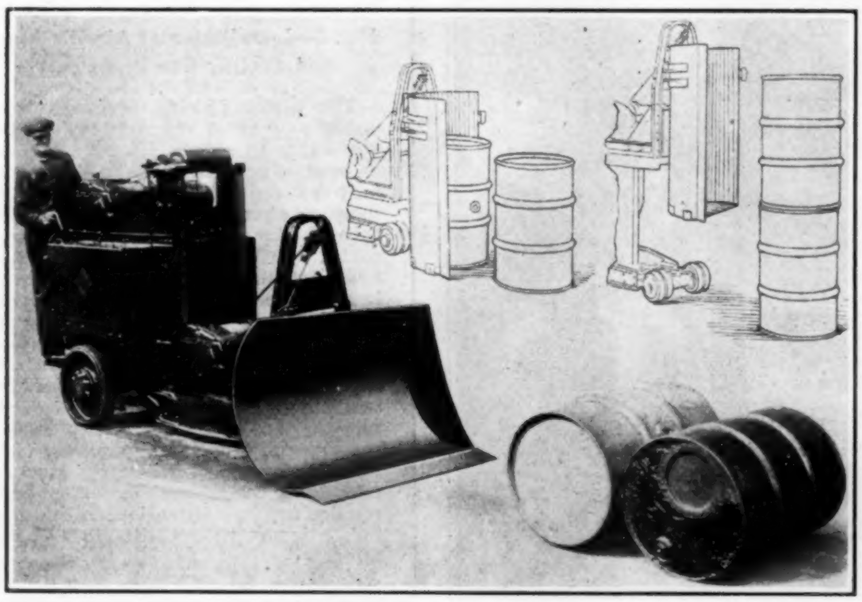
From Maker and User

Electric Elevating Truck

An electric elevating truck for transporting and stacking bulky cylindrical and rectangular loads has recently been placed on the market by the Elwell-Parker Electric Co. of Cleveland, Ohio. This truck handles rolls of fabric, carpet, linoleum, rubber stock, steel, newsprint, and barrels, bales, boxes, textile beams, etc. Its method of handling is ingenious, automatically picking up its load in any position and stacking either vertically or horizontally, as desired. The elevator raises the lower end of the load up to an elevated position of 6 ft. Thus material 6 ft. high can be stacked, end on end, to 12 ft. heights with practically no additional attention. This method saves much valuable storage space, eliminates double handling by block and tackle methods, results in the conservation of time and labor, and avoids the usual hazards attendant to hand handling.

The unit consists of an elevating truck with a revolving apron or cradle for securing the load at the end of the platform, the cradle being built to suit. The load is raised or lowered by operating the elevating platform, while the cradle is revolved to any position from the horizontal to the vertical by means of the additional hoisting unit. The two hoisting units for operating the elevator and revolving the cradle are standardized with interchangeable parts. All power for the equipment is supplied from one central storage battery carried in the battery compartment, with individual controllers for the lifting, revolving and driving mechanism.

Two dual compensating wheels are used at end nearest load, affording wider tread, improved stability, longer life to tire, and the employment of larger bearings than in any other type of somewhat similar equipment. The standard Elwell-Parker safety devices are installed, along with some additional devices covering the new operation, as, with the slacking of the elevating cable while lowering load due to striking an obstruction, the elevating motor instantly stops. One man operates the equipment and has clear vision of the forward part of the unit at all times.



Elevating and Stacking Truck for Bulky Loads

Sheets for Chemical and Heat Resistance

The Driver-Harris Co. has recently accomplished the production of a Nichrome plate or sheet, 128 in. long, 57 in. wide and [illegible] in. thick, weighing about 1,000 lb., this being the largest plate of an alloy containing a high percentage of nickel and chromium yet produced. When the early difficulties of producing resistance wire and strip of this alloy are considered, the production of a plate of this size can well be appreciated and is considered an event of great commercial importance. There has long been a demand for large sheets, or plates, of high nickel-chromium alloy, but early attempts were so discouraging and expensive that efforts to accomplish these results were abandoned.

Plates of this size should be of great value in the manufacture of certain containers and furnace parts and when perforated as screens for use in chemical sifting and ore roasting apparatus; in fact, in all services where temperatures between 1,700 and 2,200 F. are encountered; also, where high temperature and chemical resistance is required.

While the production of a plate of this alloy in this size is considered an accomplishment of importance, it has at the same time proved that with proper size billets, longer plates of the same alloy may be as easily produced. The method of manufacture is that usually used in steel sheet production, except that in the forging, rolling and hot flattening operations, higher temperatures must be applied to the material.

The properties of the Nichrome composition of which this sheet is composed are well known, but the following data as to the tensile strength at elevated temperatures and resistance to chemical action will, no doubt, be of interest and further indicate difficulties that had to be overcome for the successful accomplishment:

ULTIMATE TENSILE STRENGTH AT ELEVATED TEMPERATURES

Deg. F		Deg. F	
200	94,000	600	59,000
400	91,000	800	32,000

Resistance to corrosion:

Sulphuric acid at 20 deg. C. 125 c.c. acid in beaker, 10-gram. sample, 333 hours.

Specific Gravity of Acid	Loss in Grams Per Sq.In. Per Hour
1.830	0.00007
1.747	0.00019
1.408	0.000
1.142	0.000
1.036	0.00006

Same conditions at 80 deg. C., 71½ hours total; 24½ hours at 80 deg. C., remainder at 20 deg. C.

Specific Gravity of Acid	Loss in Grams Per Sq.In, Per Hour
1.830	0.0014
1.408	0.0010
1.036	0.0004

Nitric acid tests show rather severe corrosion. Not recommended for any concentration of this acid. HCl; action is not severe up to 20 per cent cold acid. Not recommended, however. Sulphurous acid action six times that of 1.830 specific gravity sulphuric acid under similar conditions. The action of acetic acid is severe. Entirely satisfactory for ammonium hydroxide, all concentrations. Entirely satisfactory for lactic acid.

Safety Collar

A safety collar for shafting, designed to aid in maintaining the proper alignment of pulleys, bearings, hangers and such equipment, has recently been placed on the market by the Link-Belt Co., Indianapolis, Ind. This collar is made of malleable iron. The particular feature of the new design is that the collar splits in two pieces, permitting easy installation or adjustment. It is claimed that the metal of which the collar is made is chosen particularly for strength, toughness and durability and possesses good wear- and rust-resisting qualities. It is machined inside to fit the shaft and on the sides to make an accurate fit against other appliances. The set screw by which it is fastened to the shaft is protected by a flange. This collar will be marketed through dealers located throughout the country.

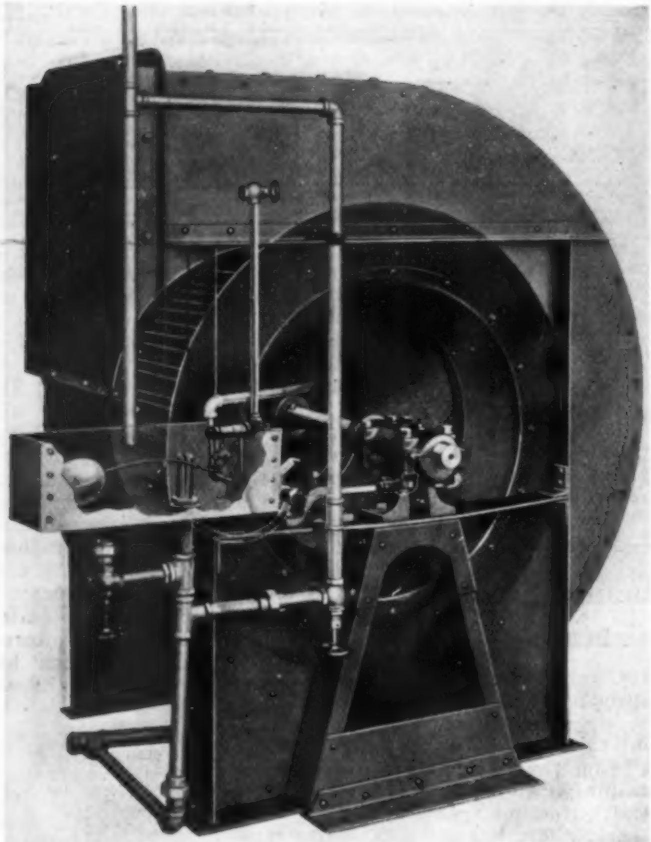


Fig. 1—Phantom View of Air-Washing and Cooling Fan

A multi-blade fan wheel revolving in a housing is provided with a large amount of screen filter surface, arranged in layers concentrically inside the blades. This surface is kept wet by means of sprays in the inlet of the pan, and the water is prevented from passing through the wheel by means of gutters, or eliminators, at the periphery of each blade. These gutters are sloped to guide entrained water to the inlet side of the wheel, where it is collected in a concentric V-shaped ring. A stationary nozzle, projecting into this V-shaped collecting ring, picks up the water and causes it to flow back through piping to the spray heads again, thus giving a system of recirculation of water, and makes unnecessary any considerable expense because of the amount of water required. An ingenious arrangement of overflow piping, together with provision for make-up water from the house service line, provides for the wasting of a small amount of water continuously, the amount of which is regulated automatically by a ball float arrangement, and can be adjusted for small or large volumes of water as the particular conditions of the installation may dictate. It is this continuous overflow of water that carries away with it entrained dust and dirt and makes possible the continuous functioning of the machine with maximum efficiency with no attention other than starting and stopping the machine, and opening and closing the fresh water valve. There are no pumps, pump motors, strainers or tanks.

Air-Washing Fan

Air conditioning, or the control of the temperature and humidity conditions in industrial plants, is being more and more accepted as a practical aid to increasing efficiency. This movement has led to a more intensive study of the process and its equipment, with the result that many new devices for the process are appearing on the market.

One of the latest of these is the "ABC" cooling and air-washing fan, made by the American Blower Co., Detroit, Mich. This fan combines in one machine the function of supplying air for ventilation and of washing and humidifying it. This construction has the primary advantage of saving space, particularly valuable in old buildings, where there is not much space available for additional equipment.

The operation of the fan is clearly shown in the phantom view (Fig. 1) and explained in the caption of that figure. Fig. 2 shows an installation of one of these air-washing and cooling fans, illustrating the relatively small space occupied.

The manufacturers claim, among other advantages of this new device, that in one unit, combining fan and washer, requiring a minimum of space and attention and costing but little more than a fan to operate, they have a machine that washes, cools and humidifies the air at the same time that it effects the ventilation.

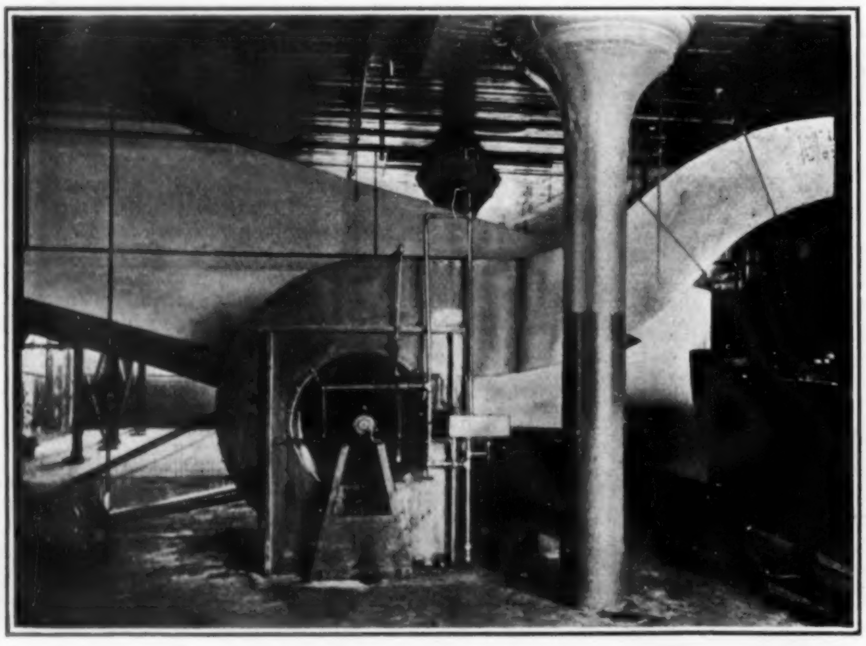


Fig. 2—Installation of Air-Washing and Cooling Fan in a Plant

The air in passing over the wet surfaces provided absorbs sufficient of the water to reduce its temperature at least 50 per cent of the entering wet bulb depression, so that the additional moisture thus evaporated and carried through the air current to the rooms to be ventilated gives a much more healthful relative humidity. This cooling and humidifying function can be obtained only through water types of washers; and while there are effective cleaning devices, or dry air filters, on the market today which also require small space compared to the standard spray type of air washer, none of them combines the functions of cooling and humidifying with the cleaning that is effected by the air-washing fan, and all require frequent attention and cleaning to insure their satisfactory operation.

U. S. Patents Issued December 9, 1924

Apparatus for Treating Rubber and Other Heavy Plastic Material. Fernley H. Banbury, Ansonia, Conn., assignor to Birmingham Iron Foundry, Derby, Conn.—1,518,129.

Automatic Density Control for Thickeners. John V. N. Dorr, New Canaan, Conn., assignor to the Dorr Co., New York, N. Y.—1,518,136.

Viscosimeter. Charles L. Tseng, Cambridge, Mass.—1,518,167.

Process of Making Alkyl Chlorides. George O. Curme, Jr., Clendenin, W. Va., assignor to Carbide & Carbon Chemicals Corp., N. Y.—1,518,182.

Agglomeration of Powdered or Finely Crushed Materials, More Particularly Fuel, by Means of Pitch. Henry du Poistesselin, Rouen, Frederick William Tabb, Paris, and Leon Hertenbein, Levallois-Perret, France, assignors of one-fifth to Octave Dubois and one-fifth to Leon Varnier, both of Rouen, France.—1,518,186.

Porous Composition of Matter. John Thompson Ellis, Kalgoorlie, Western Australia, Australia, assignor, by mesne assignments, to John Duncan Whyte, Perth, Australia.—1,518,189.

Means for Filling Battery Plates. Jesse E. S. Shepherd, Indianapolis, Ind. —1,518,226.

Art and Apparatus for Separating Liquid Gases. William B. Dodds, Jersey City, N. J., assignor to the Safety Car Heating & Lighting Co.—1,518,255.

Method of Dewatering or Filtering Activated Sludge and Producing Fertilizer. William L. D'Olier, Philadelphia, Pa. —1,518,256.

Process of Making Material for Filtering and Decolorizing. Philip L. Wooster, Manhasset, N. Y.; Lillian D. Wooster administratrix of said Philip Wooster, deceased.—1,518,289.

Dry Battery. Raymond C. Benner and Harry F. French, Fremont, O., assignors to National Carbon Co. Inc., N. Y.—1,518,301.

Aluminum Alloy. Andre Geyer, Paris, France.—1,518,321.

Refining and Deodorizing Isopropyl Alcohol. Matthew D. Mann, Jr., Roselle, N. J., assignor to Seth B. Hunt, trustee, Mount Kisco, N. Y.—1,518,339.

Method of Coating Paper. John Traquair, Chillicothe, O., assignor to Mead Pulp & Paper Co., Dayton, O.—1,518,371.

Process for Obtaining Metals From Their Chloride Vapors. Stefanus Johannes Vermaes, Delft, and Leonard Louis Jaques Van Lijnden, The Hague, Netherlands. —1,518,375.

Process for the Chloridizing Volatilization of Metals. Stefanus Johannes Vermaes, Delft, and Leonard Jacques Van Lijnden, The Hague, Netherlands. —1,518,376.

Method and Apparatus for Separating Liquid Gases. Rudolph Vuilleu Mier, New Rochelle, N. Y., assignor to the Safety Car Heating & Lighting Co.—1,518,377.

Laminated Cellulose Ether-Cellulose Ester Film. John M. Donohue, Rochester, N. Y., assignor to Eastman Kodak Co., Rochester, N. Y.—1,518,396.

Photographic Film. Frank W. Lovejoy, Rochester, N. Y., assignor to Eastman Kodak Co., Rochester, N. Y.—1,518,409.

Cellulose-Ether Composition. Ray L. Stinchfield, Rochester, N. Y., assignor to Eastman Kodak Co., Rochester, N. Y. —1,518,417.

Process for the Separation of Ammonia From Its Formative Gases. William T. Wakeford, Providence, R. I., assignor to the Nitrogen Corp., Providence, R. I. —1,518,421.

Grinder for Reducing Wood or Other Fiber to Pulp. Otto W. Greene, Elyria, O., assignor to the International Pulp Stone Co., Elyria, O.—1,518,422.

Apparatus for Coking Liquefiable Bituminous Materials. Franz Puening, Pittsburgh, Pa., assignor to American Tar Products Co., Chicago, Ill.—1,518,450.

Method for Pumping Hot Liquids. Pedro Roth, Buenos Aires, Argentina.—1,518,456.

Screen for Paper Pulp. James W. Hammond, Walpole, Mass., assignor to Bird Machine Co., Walpole, Mass.—1,518,507.

Fertilizer. Alfred Hutchinson Cowles, Sewaren, N. J., assignor to the Electric Smelting & Aluminum Co., Cleveland, O.—1,518,565.

Continuous-Screw-Feed Magazine. Morris Herbert Jones, Port Arthur, Ont., Canada, assignor to Port Arthur Shipbuilding Co. Ltd., Port Arthur.—1,518,583.

Manufacture and Production of Oxalic Acid. Alwin Mittasch and Otto Balz, Ludwigshafen-on-the-Rhine, Germany, assignors to Badische Anilin- & Soda-Fabrik, Ludwigshafen-on-the-Rhine, Germany. —1,518,597.

Rust-Resistant Plated Article. Christian John Wernlund, Tottenville, N. Y., assignor to the Roessler & Hasslacher Chemical Co., New York, N. Y.—1,518,622.

Blasting Cap. Clifford A. Woodbury, Media, Pa., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.—1,518,629.

Dry Cell. Harold de Olaneta, New Haven, Conn., assignor to Winchester Repeating Arms Co., New Haven, Conn. —1,518,637 and 1,518,638.

Brickmaking Machinery. Lauritz Neilsen Dyhrberg, Ashburton, New Zealand. —1,518,641.

Vat Dyestuff Derived From Anthraquinone and Process of Making Same. Bertram Mayer, Wilhelm Moser, and Jakob Wurgler, Basel, Switzerland, assignors to Society of Chemical Industry in Basle, Basel, Switzerland.—1,518,665.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Apparatus for Reclaiming Waste Lubricating Oils. Louis Benge, Sterling, Colo.—1,518,684.

Chlorine Compound Having Laxative Properties. Jurgen Callsen, Elberfeld, Germany, assignor to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,518,689.

Leaching Apparatus. Walter Raabe, Cothen, Anhalt, Germany.—1,518,703.

Process of Denicotinizing Tobacco. Johannes Sartig, Berlin-Zehlendorf, Germany.—1,518,706.

Manufacture of New Vat Dyestuffs. Richard Tobler, Basel, Switzerland, assignor to Society of Chemical Industry in Basle, Basel, Switzerland.—1,518,710.

Device for Introducing Sulphite Cellulose Liquid Into Furnaces. Elias Wirth-Frey, Aarau, Switzerland—1,518,723.

Process for Making Camphor. Joseph Ebert, Lyons Farms, N. J.—1,518,732.

Art of Drawing Glass. Robert L. Frink, Lancaster, O.—1,518,734.

Process for Extracting Tin From Tin-Containing Minerals, Alloys, Scoria and Scrap. Leon Lamy, St. Jeoire en Faucigny, France.—1,518,742.

Aluminum-Nickel Alloy. Joseph M. Schwartz, New York, N. Y.—1,518,760.

Method and Apparatus for Purifying Water. George Herbert Gibson, Montclair, N. J., assignor to Cochrane Corporation, Philadelphia, Pa.—1,518,784.

Process in Frosting Glass and Composition to Be Used Therein. Clarke C. Minter, New York, N. Y.—1,518,807.

Electric Battery. Samuel B. Pack, Washington, D. C.—1,518,814.

Graphite Crucible. Eduard Rietz, Sao Paulo, Brazil.—1,518,818.

Process and Apparatus for the Manufacture of Stonelike Material. Frank Euwecke, Chicago, Ill., assignor to Silica Brick & Engineering Co., Chicago, Ill.—1,518,842.

New Dye for Wool of the Safranine Series. Wilhelm Herzberg, Berlin-Wilmersdorf, and Oswald Scharfenberg, Berlin-Schoneber, Germany, assignors to Actien Gesellschaft für Anilin Fabrikation, Berlin, Germany.—1,518,847.

Process of Producing Fluorides. Aladar Pacz, Cleveland Heights, O.—1,518,872.

Method of and Apparatus for Working Paper Stock. Anton J. Haug, Nashua, N. H., assignor to Improved Paper Machinery Co., Nashua, N. H.—1,518,922.

Process for Treating Organic Materials to Produce Meal and Oil. Stanley Hiller, San Jose, Calif., assignor to Stanley Hiller, Inc., San Francisco, Calif.—1,518,926.

Process for Producing Woollike Effects Upon Cotton Fabrics. Harold I. Huey, Saylesville, R. I., assignor to Sayles Finishing Plants, Inc., Saylesville, R. I.—1,518,931.

Rotary Retort. Harald Nielsen, London, England, assignor of one-half to Bryan Laing, Hatfield, Herts, England.—1,518,938.

Drier. George B. Damon, Belvidere, N. J., assignor to Vulcan Iron Works, Wilkes-Barre, Pa.—1,518,966.

Method of Making Articles From Pulp and Apparatus for Practicing the Method. Walter Henry Drake, Cleveland, O. —1,518,968.

Light-Sensitive Composition. George Wellington Miles, Sandwich, Mass., assignor to American Cellulose & Chemical Manufacturing Co., Ltd., New York, N. Y. —1,518,997.

Nitrochlor Derivatives of Open-Chain Hydrocarbons and Process of Making Same. Elias Bielouss, Washington, D. C. —1,519,017.

Process for the Production of Active Metallic Catalysts. Ernest Joseph Lush, London, England, assignor to Technical Research Works, Ltd., London, England. —1,519,035.

Belgian Window-Glass Exports in Pre-War Position

The new strength of the Belgian window-glass industry previously reported is again reflected in the total of October sales of 30,000,000 sq.ft., as against a capacity production of 25,000,000 sq.ft., with all furnaces fired, say advices to the Department of Commerce from Commercial Attaché Cross, Brussels. This figure does not include a 6,000,000-ft. order for the Pacific coast, which, now that specifications have arrived, will be taken up in the November total.

Looking back over the autumn since the summer lull, it appears, Mr. Cross states, that Belgian window glass is in fully as flourishing a position, from the export standpoint, as was the case before the war. The limited stocks accumulated during the summer have not weighed upon the market in any appreciable degree. From the standpoint of the handblowing plants, the progress of mechanical production processes is disquieting, but the more enlightened representatives of the industry have fairly well made up their minds to the fact that these methods will gradually replace the more expensive and antequated hand systems.

Business in lead and crystal glass also shows improvement.

Industrial Notes

The Bethlehem Foundry & Machine Co. and the Bethlehem Foundry & Machine Corporation will discontinue their New York office on Dec. 31. Thereafter all business will be transacted from Bethlehem, Pa.

The Conveyors Corporation of America, Chicago, Ill., announces the appointment of C. S. Price, First National Bank Building, Hazleton, Pa., as its district representative for northeastern Pennsylvania. Associated with Mr. Price in the sale of the American steam jet ash conveyor is E. E. Elliott, who has had wide experience in steam jet ash disposal engineering.

The Link-Belt Co. of Chicago has moved its St. Louis branch from 705 Olive St. to larger and more convenniently located offices at 3638 Olive St.

News of the Industry

Summary of the Week

Defeat of Senator Smith's amendment of Muscle Shoals bill providing for government operation is taken to presage the passage of the Underwood measure.

Georges Claude elected to membership in the French Academy of Sciences.

American Engineering Council to take aggressive action for a national department of public works at annual meeting in January.

Nichols medal for 1925 awarded to Dr. E. C. Franklin of Leland Stanford University.

Favorable action expected in House on Sheppard bill authorizing $500,000 for investigation of domestic potash resources.

National hall of fame in Washington for inventors, engineers and pioneers of American industry proposed.

Hearings on Cramton bill were started on Dec. 18 before a subcommittee of the Committee of the Judiciary.

Japan considers import tariff as a substitute for government subsidy for dye industry.

Senate Votes Against Government Operation of Muscle Shoals

Amendment of Senator Smith Defeated—Underwood Bill Likely to Pass—Joint Investigating Commission Probable

THE outstanding event of a week's protracted discussion in the Senate of Muscle Shoals was the decisive defeat of the amendment proposed by Senator Smith of South Carolina. The vote, which was taken Dec. 16, was 32 to 49. Thus the Senate emphasized its disapproval of outright public operation of the properties.

Despite the unexpected and prolonged opposition to the Underwood bill in the Senate, the expectation, as this is written, is that the measure will pass in practically its present form. The legislators are beginning to speculate on what may happen in the House. Since the Underwood proposal is a substitute for the Ford bill, which originated in the House and which was passed by that body, ordinarily the next legislative step would be for the House to request a conference. In this instance, since the House has had no opportunity to consider a radically different measure, it is understood that an effort will be made to secure the recommitment of the bill so that the Committee on Military Affairs may study it.

Senators Show Lack of Information

Further debate of the Underwood substitute in the Senate has produced little new thought on the proposition. Many Senators have insisted on going over the situation in their own way. The debate has revealed a great lack of information as to power production and distribution on the part of some of the Senators. Some of them apparently have no conception of the costs of distribution.

One of the newspapers in the capital printed an editorial declaring the real purpose of Senator Underwood's effort to be in behalf of the Alabama Power Co. At the request of the Alabama Senator the incident is being made a matter of a Senatorial investigation. To those who have followed the Muscle Shoals development from its inception it has been very clear that Senator Underwood's ideas have been at complete variance with those of the Alabama Power Co.

Two days of the debate were given over to a discussion of the advisability of requiring the proposed government corporation to abide by Civil Service regulations in the securing of its personnel. On this subject there was no lack of concrete knowledge. The proposal to make such a requirement, however, was thrown overboard.

It also required many hours of debate to determine to the satisfaction of all members of the upper chamber that phosphate is the meat between nitrogen and potash in the fertilizer formula of 2-8-2.

Joint Commission Likely

The prospects all point to the ultimate adoption of legislation referring the entire matter to a joint commission. This may mean that definite disposition of the property will not be made until next winter. While the Wilson Dam will be completed before July 1, it is pointed out that time will be required to get the generators into working order and to prepare the plant for the delivery of power. At least the primary power can be made available for distribution by using the transforming facilities at the Sheffield steam plant. That would make available 120,000 kw., and it is believed that the Alabama Power Co. will devise means for securing the distribution of this power so that it may be utilized in the interim during which the settlement is being arranged.

Hearings on Cramton Bill Held Before Senate Committee

The chemical industry is much encouraged by its success in having secured the recommitment of the Cramton prohibition bureau bill. Representatives of the industry are outspoken in their commendation of Senator Sterling in charge of the bill, who throughout the controversy has shown a disposition to be entirely fair.

The industry is not attempting to delay the measure, it has been explained to Senator Sterling. All that is wanted is an opportunity to explain briefly the new burdens which the bill will heap upon a legitimate industry. In the opinion of representatives of the chemical industry all of the testimony necessary to set forth the positions of each of the parties to the controversy can be taken at four sessions of the committee.

The only points in dispute are those involving how the board of review shall be organized and whether or not the chief of the division of industrial alcohol and chemistry is to be chosen by the Secretary of the Treasury or by the Prohibition Commissioner.

The hearings began Dec. 18 before a subcommittee of the Committee on the Judiciary.

News in Brief

Bassett Awarded Douglas Medal—Award of the James Douglas gold medal to William H. Bassett, metallurgist of the American Brass Co., Waterbury, Conn., is announced by the American Institute of Mining and Metallurgical Engineers. The medal, commemorating Dr. James Douglas, twice president of the Institute, is bestowed annually for distinguished achievement in non-ferrous metallurgy. It was established in 1922 by anonymous donors. The award, made by the James Douglas Medal Committee, of which Benjamin B. Thayer is chairman, was unanimous. Other members of the committee are: Charles F. Rand, Arthur L. Walker, Arthur S. Dwight, David Cole, Charles W. Goodale, Charles W. Merrill, Frank M. Smith, Walter Douglas, E. P. Mathewson, Lawrence Addicks, Paul D. Merica, John H. Janeway, Frederick Laist, William Kelly. Mr. Bassett is one of the most widely known metallurgists in the country. He is a director of the Institute, of which he has been a member since 1892.

Ohio Leads in Ceramic Production—According to recent figures compiled by the United States Department of All Commerce, Bureau of Census, Ohio continues to lead all other states in the Union in the production of ceramic products. There are 102 plants of this character in Ohio, manufacturing chinaware, electrical porcelain, sanitary ware and affiliated products. New Jersey is next, with a total of 63 plants for the manufacture of ceramic wares; West Virginia stands third, with 21 potteries. It is pointed out that the value of chinaware and tableware production increased 36 per cent between 1921 and 1923 in all such plants in the country, while the output of sanitary ware in this same period advanced 77 per cent.

Pennsylvania to Have Industrial Standards Bureau — Plans have been perfected for the establishment of a Bureau of Industrial Standards in the Pennsylvania State Department of Labor and Industry, Harrisburg, to function at an early date. The bureau has been arranged to carry out a policy of having inspectors act as expert advisors in safety work in all branches of manufacture throughout the state; it will be for research, educational and similar purposes, keeping in close touch with the development of standards for health and safety, working, as well, with plant managers and superintendents. Cyril Ainsworth, secretary of the labor department, has been appointed director of the new bureau.

Swedish Denatured Alcohol to Be Marketed—The "Free-of-Tax" Alcohol Co., which has been preparing for sale a Swedish denatured alcohol for motive combustion purposes, is about to place its product on the market and has asked the Swedish Railway Committee to put into immediate force for its benefit the new lower freight rates. This company claims that unless it can get the benefit of lower internal freight rates at once its product will cost too much and a market cannot be developed. The original object in granting this native alcohol tax exemption was to give a native industry an opportunity to grow.

China Chemists' and Druggists' Review—Trade Commissioner A. V. Smith, Shanghai, has submitted to the Chemical Division a copy of the initial issue of the *China Chemists' and Druggists' Review*. This periodical has been started by H. Schloten, a German chemist of long residence in China, for the purpose of assisting in the development of pharmacy and for the advancement of the chemical and drug trades on modern lines in China.

Brussels International and Commercial Fair—The Sixth Official Brussels Commercial Fair, an annual international business exposition, which has become one of the most important fairs of Europe since the war, will be held from March 25 to April 8, 1925, in the Gardens and Halls of the Cinquantenaire. The fair is organized by the city of Brussels and the Belgian Government.

General Electric Staff Changes — Francis C. Pratt, vice-president of the General Electric Co. in charge of engineering, has been appointed vice-president in charge of manufacturing to fill the vacancy caused by the resignation of George E. Emmons. Mr. Pratt will also be chairman of the manufacturing committee. H. F. T. Erban will be assistant vice-president in charge of manufacturing and engineering under Mr. Pratt.

F. A. Hoyt Elected President of Disinfectant Association

At the eleventh annual meeting of the Insecticide and Disinfectant Manufacturers Association, held last Monday and Tuesday, at the Hotel Astor in New York, Frederick A. Hoyt, of the Frederick Disinfectant Co., Atlanta, Ga., was elected president for the ensuing year. Other officers elected were: Benjamin Newman, United Sanitary Products Co., first vice-president; W. H. Gesell, Lehn & Fink, second vice-president; H. W. Cole, Baird & McGuire, secretary; R. J. Jordan, Jordan Coal-Tar Products Co., treasurer.

The association adopted a recommendation to urge Congress for the passage of a national phenol coefficient law. It also went on record as favoring federal investigation into charges of commercial bribery in the disinfectant business. It also was proposed to adopt a definite plan for co-operative advertising in order to increase the products of the industry.

The annual banquet of the association was held at the Hotel Astor on Monday evening and was followed by a theater party. On Tuesday afternoon the delegates were the guests of the Atlantic Tar & Chemical Co. at Bayway, N. J.

Nichols Medal for 1925 Awarded to Dr. E. C. Franklin

The Nichols medal, awarded annually by the New York Section of the American Chemical Society, goes for 1925 to Dr. Edward Curtis Franklin, professor of organic chemistry in Leland Stanford University, California. The medal is bestowed "for the research published during the current year, which in the opinion of the jury is most original and stimulative to further research." It was established by Dr. William H. Nichols to stimulate original research in chemistry and last year was awarded to Charles A. Kraus, professor of chemistry at Brown University.

Doctor Franklin is one of the best known of American chemists, and last year was president of the American Chemical Society, being succeeded by Dr. Leo Hendrik Baekeland, of New York. He was born in Geary City, Kan., in 1862, receiving the degree of B.S. from the University of Kansas in 1888 and an M.S. in 1890. During 1890-1 he was a student in the University of Berlin, and in 1894 received his doctor's degree from Johns Hopkins University. He began teaching at the University of Kansas as assistant in chemistry in 1888, becoming professor in 1899 and continuing in this post until 1903, when he joined the faculty of Leland Stanford as associate professor of chemistry. He has been a full professor at Stanford since 1906.

Professor Franklin was chief of the division of chemistry of the U. S. Public Health Service during 1911-13, and in 1906 was a member of the U. S. Assay Commission. He has been a member of the Advisory Board of the U. S. Bureau of Mines, physical chemist of the U. S. Bureau of Standards, and consulting chemist of the U. S. Ordnance Bureau. He is a fellow of the American Association for the Advancement of Science, and a member of the National Academy of Sciences, American Chemical Society, Washington Academy of Sciences, American Philosophical Society, the Kansas Academy of Sciences and the California Academy of Sciences.

British Firm Controls Caustic Soda Trade of Japan

Because of the excellent facilities maintained by the British firm of Brunner, Mond & Co. in Japan, American exporters of caustic soda are having difficulty in competing in that market. Apparently American sales, which at times reach considerable proportions, are possible only when exchange is favorable to the United States.

In 1923, when exchange was favorable, the United States furnished 54 per cent of the 25,244,000 lb. of caustic soda imported into Japan that year. During 1924, however, the exchange rate has been unfavorable to imports from the United States and as a result most of the business has gone to the British.

Despite the fact that Japan is attempting to build up a domestic industry by the application of import duties, the country's requirements for foreign caustic soda are increasing rapidly.

Washington News

Engineering Council Preparing for Annual Meeting

The annual meeting of the American Engineering Council will be held in Washington, Jan. 16 and 17. The administrative board of the Council will convene in that city on the previous day. Co-operation of the engineering societies of the United States with the federal government in carrying out the provisions of the Clarke-McNary act, and the policy of the engineering profession on the question of consolidating the public works functions of the government will be among the principal topics considered.

Interpreting the recent action of the administrative board as to public works, the president of the Council, James Hartness, says:

"The American Engineering Council will aggressively endeavor to have included in the proposed Division of Public Works all of the construction work now done by the government, which means, in the light of the present bill pending in Congress, that we shall endeavor to have included in that bill, by amendment or otherwise, rivers and harbors and the Mississippi River Commission. There will be a meeting of our committee on government reorganization as well as of the advisory council in Washington the evening of Jan. 15 to develop concrete plans for carrying out the proposed changes."

Efforts to consolidate the engineering and public works functions of the government were started by the engineers in 1919. Substantial progress has been made, it is thought, and the engineering profession now looks forward to the early adoption in principle of its recommendation.

Government Appropriation Likely for Potash Research

After having heard representatives of the Geological Survey, the Bureau of Soils and others concerned, the Committee on Mines and Mining of the House of Representatives is expected to report favorably the Shepperd bill, which authorizes the expenditure of $500,000 for prospecting and research, looking to the development of domestic potash resources. The Shepperd bill has already been passed by the Senate.

While it is probable that the larger proportion of the appropriation would be expended in prospecting operations with core drills in the Southwest, where thin beds of potash have already been found, there also would be extensive work on the recovery of potash from blast-furnace, cement mill, sugar mill and distillery operations.

Among those testifying were Dr. George Otis Smith, director of the Geological Survey; George R. Mansfield, the Survey's potash specialist, and Dr. J. W. Turrentine, of the Bureau of Soils. These men were called in simply to answer the technical questions which were propounded by members of the committee, but it was evident from the trend of their remarks that they regarded as well within the range of probability that supplies of potash sufficient to meet the requirements of the United States eventually can be developed within our own borders. It was pointed out that all of the geological evidence is favorable to the occurrence of subterranean deposits of potash in the Southwest. The narrow beds that have been encountered almost certainly thicken into great deposits at the low points at which the seas of earlier geological ages finally were evaporated.

Hall of Fame Proposed in Washington

To Commemorate Achievements of Pioneers in Invention, Engineering and Industry

Charles P. Steinmetz, Alexander Graham Bell, Thomas A. Edison, the Wright brothers, Eli Whitney, Capt. John Ericsson, Robert Fulton, Mergan-thaler and other giants of American inventive genius will be enduringly enshrined in a "National Hall of Fame for Inventors, Engineers and Pioneers of American Industry," to be located in the great central rotunda of the projected $5,000,000 National Museum of Engineering and Industry, to be erected on the Mall in Washington, D. C.

Decision to establish the new American hall of fame has been unanimously reached by the board of direction of the museum foundation, which is charged with completing a national endowment of $10,000,000 for the museum movement. Bronze and marble sculptures of outstanding American inventors, engineers and industrial leaders whose achievements have placed the United States in the forefront of industrial progress will be installed in the rotunda chamber. The records of their achievements, which are now scattered throughout the United States, including all original models that are recoverable and authentic replicas of those that have been lost or destroyed, will be assembled in the main industrial chambers of the new museum.

Co-operation From Prominent Men

The foundation has received formal acceptances from Thomas A. Edison, Orville Wright and Charles F. Brush to be vice-presidents of the museum movement organization. They will serve in collaboration with Vice-Presidents Leo H. Baekeland, Edward G. Acheson, Frank J. Sprague and Edward Weston. Charles M. Schwab, chairman of the Bethlehem Steel Co., and Melville Stone, president of the Associated Press, also have accepted positions on the honorary advisory board. They will serve with Herbert Hoover, Dr. Charles W. Eliot, president emeritus of Harvard, and General George W. Goethals.

Many American colleges specializing in technical education have already attempted on a limited scale to maintain museum exhibits where members of the student body can study in graphic detail the evolution of the technical field in which they are preparing to take their places. The present movement for the National Museum of Engineering and Industry embraces, besides the central edifice in Washington, a chain of local museums of industry, situated in the various industrial sections and affiliated with the parent institution, for the diffusion of technical knowledge to all parts of the country.

Patent Commissioner's Report Shows Office Is Catching Up

In his annual report to the Secretary of the Interior, the Commissioner of Patents reviews the work of his office for the fiscal year ended June 30, 1924. In that time the number of applications for patents, designs and trademarks decreased from 100,724 to 99,503, but the total net receipts from all sources amounted to $3,042,276.22, the largest sum ever received by the Patent Office in any one year.

At the close of the previous fiscal year there were awaiting official action 72,475 patent applications, 2,792 design applications and 3,838 trademark applications, a total of 79,105. These have been reduced so that at the date of the report there were 60,334 patent cases, 323 design cases and 1,988 trademark cases, a total of 62,645 awaiting disposal, a decrease of 16,460 cases.

The Commissioner also reports that gains have been made with respect to dates and that the office has caught up in its work on an average of about 3 months per division. With the addition of 100 examiners authorized by Congress it is hoped that within 2 years the office will not be more than 2 months in arrears.

F.T.C. Order Against Reliance Varnish Co.

The Federal Trade Commission has issued an order requiring the Reliance Varnish Co., of Louisville, to discontinue unfair methods of competition in its business. The respondent admits the charges of the complaint and agreed with the commission as to a statement of facts upon which the order is based. B. G. Robertson and B. J. Robertson are named as respondents in the order and are president and vice-president respectively of the company. They also act as salesmen visiting the trade and soliciting and securing orders for varnish and allied products manufactured by the company. The respondents sell to manufacturers of furniture and of automobiles.

The commission found that the respondents have offered and given to superintendents, foremen and other employees of furniture and automobile manufacturers, without the knowledge or consent of the respective employers, substantial sums of money as inducements to influence such employees to purchase products of the Reliance Varnish Co. Such sums of money are promised rewards for having induced employees to purchase respondent's products.

Dye Questionnaire for Tariff Commission Almost Completed

The Chemical Division of the Tariff Commission has received practically complete returns from its questionnaire to manufacturers of coal-tar dyes asking them to report sales by total quantity and aggregate price of each color for the first 9 months of 1924. It is expected that a summary of these data will be made public about Jan. 1.

Shortly after the first of the year a second questionnaire will go forward asking producers similar information for the last 3 months of 1924. Data for the two periods, reduced to comparable terms, will afford basis for deductions as to the effects of the reduction in the ad valorem duty on coal-tar dyes which became operative Sept. 22 under the terms of the tariff act.

Prof. James Kendall Is Elected Chairman N. Y. Section A.C.S.

Prof. James Kendall, of the department of chemistry, Columbia University, has been elected chairman for 1925 of the New York Section of the American Chemical Society. Dr. B. T. Brooks, consulting chemist, was chosen vice-chairman, and D. H. Killheffer secretary-treasurer. The new executive committee is composed of Prof. D. D. Jackson, C. R. Downs, Prof. R. R. Renshaw, and Miss Lois Woodford.

Councillors elected are: B. T. Brooks, C. E. Davis, James Kendall, D. H. Killheffer, H. B. Lowe, Prof. H. R. Moody, R. P. Rose, K. G. Mackenzie, R. R. Renshaw, R. L. Corby, Prof. T. B. Freas, R. Norris Shreve, S. P. Burke, all of New York City; M. H. Ittner, Jersey City; C. O. Johns, Bayway, N. J.; David Wesson, Montclair, N. J.; Lauder W. Jones, Princeton University; N. F. Chaney, Long Island City.

Georges Claude Elected to the Academy of Sciences

Georges Claude, the inventor of the largely used process for the production of synthetic ammonia in France, has been elected a member of the French Academy of Sciences, taking the place of the late B. Chardonnet. M. Claude was elected in the section of applied science to industry on the first vote by 41 against 17 for his nearest competitor.

A former pupil of Curie, M. Claude is 55 years of age and has to his credit a great number of scientific inventions, of which the most notable are processes for the manufacture of liquid air and synthetic ammonia.

Chemical Industry Demoralized in Hungary

Under the demoralized conditions existing in Hungary manufacturers of chemicals in that country are finding it difficult to operate at costs that permit of competition with the imported commodities. This applies even to caustic soda, the rather large requirements of the country being furnished mostly from Great Britain.

Technical Men in Industry

Survey Being Made to Determine How Engineering Education May Meet Industrial Needs

The National Industrial Conference Board of 247 Park Ave., New York City, has undertaken to find out the answer to the question, "What kind of training does industry expect from men needed for executive, administrative and technical positions?" It has begun the task of investigating the basic industries of the country with the view of determining how engineering education may best be adjusted to meet the industrial needs.

It is estimated by the board that American industry may need 400,000 more persons for this type of responsible position in 1930 than it used in 1920. This is based upon the increasing ratio of administrators, supervisors and technical experts to the total number gainfully employed in industry, as detailed in the United States census of occupations.

Scope of the Survey

It was stated that the board had selected for specific study ten or twelve major branches of American industry in order to find what technical men are now in industry, what positions they occupy and what are their activities, what further opportunities the industry offers for additional employment of technically trained men, and in what respect the technical colleges may adapt their programs to the practical requirements of industry. The situation in each industry is being studied separately.

The board has now completed the first two of the series of investigations covering the rubber and the paper pulp industries. Seventy-five companies co-operated with the board, covering 113 plants, with more than 100,000 employees, representing more than 83 per cent of the rubber industry. The board found that of the total number of employees 7 per cent occupy important positions, and that of these 7 per cent 20 per cent are college graduates.

In the paper and pulp industry 150 companies, representing more than 35,000 employees, co-operated with the board. In this industry the board found that but little more than 7 per cent of the men employed held executive or other important positions, and that of these 22 per cent were college graduates, 13 per cent being graduates of recognized technical colleges.

Practical Experience Hard to Get

"One of the problems existing in adapting college graduates to responsible positions in industry is the difficulty of obtaining practical experience in line with theoretical instruction," says the report. "Several possible ways of accomplishing such an end in some measure are indicated in the reports, such as summer employment and the co-operative college course, and it was found that very few of the companies offer such opportunities to technical college men.

"The problem of selection of employment by the college graduates and of men for employment by the companies was canvassed. This showed that quite a considerable number of men, about 60 per cent of the total, had made a conscious choice of the rubber industry as a field for employment. On the other hand, by far the greatest number of college men reported entered the paper industry because of secondary reasons rather than because of any particular interest in or unusual ability for it. In both industries the companies have so far developed very little in the way of systematic method or in the way of selection of technically trained men for employment and development in the industries.

Other Industries to Be Surveyed

"When the entire series is completed the findings will be analyzed and published by the board in a composite report on 'Technical Education and American Industry.' In that report specific points will be discussed at length and complete sections devoted to each of the industries previously summarized.

"A study of the textile industry will be the next in the series, and surveys of the metal trades, chemical industry and automotive industry are in preparation. The board points out that the gratifying co-operation on the part of industrial executives is ample evidence of the importance with which industry regards this problem."

Calendar

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, Smithsonian Institution, Washington, D. C., Dec. 29 to Jan. 3.

AMERICAN CERAMIC SOCIETY, annual meeting, Columbus, Ohio, Feb. 16 to 21.

AMERICAN CHEMICAL SOCIETY, New York Section, Jan. 9.

AMERICAN ELECTROCHEMICAL SOCIETY, Niagara Falls, April 23 to 25.

AMERICAN PULP AND PAPER MILL SUPERINTENDENTS ASSOCIATION, Niagara Falls, N. Y., June 4 to 6.

AMERICAN MANAGEMENT ASSOCIATION, annual convention, Hotel Astor, New York, Jan. 28, 29 and 30.

AMERICAN SOCIETY FOR TESTING MATERIALS, twenty-eighth annual meeting, Atlantic City, N. J., June 22 to 26.

BRUSSELS INTERNATIONAL AND COMMERCIAL FAIR (sixth), Brussels, Belgium, March 25 to April 8.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, twenty-third annual convention, Prince George Hotel, Toronto, Canada, Jan. 20 to 22.

CANADIAN PULP AND PAPER ASSOCIATION, Montreal, Jan. 28 to 30.

COMPRESSED GAS MANUFACTURERS ASSOCIATION, twelfth annual meeting, Hotel Astor, New York, Jan. 26.

SOUTHERN EXPOSITION, Grand Central Palace, New York, May 11 to 23.

New York Academy of Sciences Elects Officers

At the annual meeting of the New York Academy of Sciences on Monday evening, Dec. 15, the following officers were elected for 1925:

President, John Tatlock; vice-presidents, Chester A. Reeds, H. D. Senior, Carl P. Sherwin, Elsie Clews Parsons; recording secretary, Ralph W. Tower; corresponding secretary, Henry C. Crampton; treasurer, George H. Sherwood; councillors (1925-1927), Archer M. Huntington, Barrington Moore; librarian and editor, Ralph W. Tower.

Financial

Subscription lists for cash subscriptions to the $15,000,000 Central Leather Co. 20-year first lien sinking fund gold bonds, due Jan. 1, 1945, have been closed, the amount offered having been oversubscribed.

The Barnet Leather Co. has declared regular quarterly dividend of 1¾ per cent on the preferred, payable Jan. 1.

A report from Toledo states that the Libby Glass Co. has absorbed the Nonik Co. of New York.

The Firestone Tire & Rubber Co. has declared a quarterly dividend of $1.50 on the common, payable Jan. 20. Previous rate had been $1 quarterly. Company also declared regular quarterly dividends of $1.50 on the 6 per cent preferred, payable Jan. 15, and $1.75 on the 7 per cent preferred, payable Feb. 15.

The annual financial statement of the Dominion Glass Co., Ltd., for the fiscal year ended Sept. 30, 1924, shows an improvement in net profits and a stronger working capital position. Net profits for the twelve months amounted to $758,369, as compared with $724,664 in the preceding year.

Natural Dyestuffs and Tanning Materials Gained in 1923

The Department of Commerce announces that, according to the data collected at the biennial census of manufactures, 1923, the establishments engaged primarily in the manufacture of natural dyestuffs and tanning materials reported products valued at $35,971,612, an increase of 27 per cent as compared with 1921, the last preceding census year.

The value of the major groups of products as reported for 1923, with their percentages of increase or decrease as compared with 1921, are as follows: Tanning materials (not including those made and consumed in the same establishments), $14,970,095, 26.2 per cent increase; sizes, $8,966,619, 26.5 per cent increase; natural dyestuffs, $2,649,623, 34.6 per cent decrease.

Of the tanning materials produced for sale the most important were chestnut and quebracho. For the former there was reported a production of 433,512,000 lb., valued at $8,410,259, an increase of 73.2 per cent in quantity and 41.9 per cent in value as compared with 1921; and for the latter 103,981,000 lb., valued at $3,349,472, an increase of 58.6 per cent in quantity and 36.9 per cent in value.

The statistics for 1923 and 1921 are presented in the following table:

		1923		1921	Per Cent of Increase
Number of establishments		125		123	1.6
Wage earners (average number)		3,243		2,993	8.4
Maximum month	May	3,481	Oct.	3,346	....
Minimum month	Dec.	2,862	Jan.	2,531	....
Per cent of maximum		82.2		75.6	....
Wages		$3,800,783		$3,007,547	26.4
Cost of materials (including fuel and containers)		$24,033,018		$20,105,517	17.6
Products, total value		$35,971,612		$28,310,708	27.0
Value added by manufacture		$11,938,594		$8,205,191	45.4

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CHEMICALS for tanneries. Porto Alegre, Brazil. Agency.—12,687.

FERTILIZERS. Alkmaar, Netherlands. Purchase and agency.—12,628.

PAINTS, machine, of a blue black tone. Berlin, Germany. Purchase.—12,695.

PHOSPHATE ROCK for superphosphate. Budapest, Hungary. Purchase and agency.—12,679.

ROSIN and caustic soda. Bahia, Brazil. Purchase and agency.—12,629.

ROSIN, 100 tons monthly. Semarang, Java. Purchase and agency.—12,681.

WAX. Hamburg, Germany. Purchase.—12,634.

Import Tariffs to Aid Japanese Dye Industry

While great pressure is being brought in Japan to retain the government subsidy to the dye industry and the existing licensing system for imports, it seems probable that the subsidies to Japanese manufacturers will not be renewed and that import tariffs will be applied. Despite the subsidies, the dye makers are said to be losing money.

Such a change will be adverse to American dye manufacturers, in that they now enjoy an advantage over the Germans through the terms of the licensing arrangement. The German Ambassador to Japan, Dr. Solf, has been very active in his efforts to have the restrictions against the German dyes applied also to those made in the United States.

This results in embarrassment to the government, which would be avoided by tariff regulation.

A controversy of no small proportions is now raging as to the level of the duties. The manufacturers of dyes have a very different idea of the duty necessary for their protection than have the Osaka Dyestuffs Guild and other consumers. There is also the deterring factor that any duty which is in effect an embargo against American goods provides an additional argument for the manufacturers of artificial silk in the United States for a duty on raw silk and increases of the existing duty on silk advance in manufacture. Since the Japanese textile industry operates on a very narrow margin of profit and relies greatly on the export trade and since the United States is Japan's best silk customer, it is apparent that powerful influences will operate to keep the dye duties at the lowest possible point that will allow the Japanese industry to survive.

Trade Notes

A report from Chattanooga says the Nichols Copper Co. has asked that a receiver be appointed for the Ducktown Sulphur, Copper & Iron Co. The latter is a British corporation and the suit for receivership is expected to result in a transfer of ownership to American interests.

H. S. Firestone, president of the Firestone Tire Co., has announced plans for enlarging the plant of the company at Akron so as to give a daily output of 42,000 tires.

The Manufacturers Kid Corporation, Lynn, Mass., has filed deeds covering the purchase of the former plant of the Victor Leather Corporation, Allentown, Pa., for a consideration of $70,000. The property will be remodeled and improved by the new owner for a branch plant, to produce kid leathers.

Colonel Alan G. Goldsmith, of Middletown, Ohio, chief of the European Division of the Bureau of Foreign and Domestic Commerce, has tendered his resignation, effective Jan. 1, 1925. Colonel Goldsmith will return to the G. H. Mead Co., a paper concern in Dayton, Ohio, with which he was connected before entering the Department of Commerce.

Receivers for the Butterworth-Judson Corporation have ordered the sale of the plant of the company at Newark, N. J. The sale will be held on Wednesday, Jan. 21.

Haber Dealing With Individuals, Not With Japanese Government

The charges recently voiced by Dr. Charles H. Herty, president of the Synthetic Organic Chemical Manufacturers Association, to the effect that the recent visit of Prof. Fritz Haber, of the Kaiser Wilhelm Institute, was in reality "to arrange closer relationships with the Japanese in the matter of gas warfare," has aroused much interest in Washington. The understanding is that Professor Haber entered into no negotiations with the Japanese Government, but instead dealt with the powerful Hoshi company. It is thought that this company will make arrangements to keep closely abreast with war-gas developments.

Transportation Costs a Factor in Establishing Branch Plants

The striking success being made in the manufacture of paints, enamels, stains and varnishes in British Columbia is regarded as an indication that further decentralization of paint manufacture in the United States is likely to be one of the trends of the future. The increased level of freight rates, particularly to intermountain territory, as well as the growing importance of the market in that section of the country, is expected to result in the establishment of branch plants or of new enterprises in that section.

Men You Should Know About

Sir WILLIAM ALEXANDER recently resigned as chairman of the board of directors of the British Dyestuffs Corporation, London, England, and has sailed for Europe, following a visit of a number of weeks in the United States, in which he visited artificial silk mills in the Eastern district. He has been succeeded, as chairman of the company noted, by Lord Ashfield, heretofore representative of the British Government on the board.

EDWARD W. BEADEL of New Castle, Pa., has sailed for Buenos Aires, where he will represent the Bethlehem Steel Co. His mission is expected to require about 2 years. Mr. Beadel has been president of the Pennsylvania Engineering Works, New Castle, for many years.

CHARLES T. BRAGG of Detroit, Mich., has been elected chairman of the Associated Technical Society of that city.

Dr. H. N. CALDERWOOD, formerly chemist at the U. S. Forest Products Laboratory, is now assistant professor of chemistry at the University of Wisconsin. He has charge of the laboratory instruction given to engineering students.

FRANK S. GERY, vice-president of the Glen-Gery Shale Brick Co., Reading, Pa., has been re-elected president of the local Kiwanis Club.

F. E. HARTMAN, chief chemist of the United States Ozone Co., Scottdale, Pa., spoke before the California Section of the American Chemical Society, at San Francisco, Dec. 5, on "The Ionization of Gases by the Corona Discharge."

H. JOHNSON, now connected with the Courtalds Co., Ltd., London, England, manufacturer of artificial silk, has been appointed managing director of the Viscose Co., Marcus Hook, Pa., manufacturer of similar products, and will arrive in this country early in January to assume charge. Dr. Charles A. Ernst will continue as president of the company.

Dr. S. M. MCELVAIN, instructor in chemistry at the University of Wisconsin, has taken over the courses in organic chemistry formerly conducted by Assistant Professor Glenn S. Skinner, who has resigned to enter industrial work.

LEROY H. MINTON, general superintendent and director of the General Ceramics Co., Metuchen, N. J., gave an address on "Industrial Savings From the Viewpoint of the Employer" at a meeting devoted to the industrial thrift movement at the Elks Club, Perth Amboy, N. J., Dec. 4. CHARLES W. HILL, plant manager of the Atlantic Terra Cotta Co., Perth Amboy, also tendered an address on the topic "Industrial Savings From the Plant Manager's Viewpoint."

FRASER M. MOFFATT, president of the Tanners Council, gave an interesting talk on the interdependence of the tanning, hide and skin trades, at the annual meeting of the National Association of Importers of Hides and Skins, New York, Dec. 11.

EARL OLIVER has resigned as vice-president and general manager of the Marland Oil Co. of Mexico, Ponca City, Okla., and as director of economics for the Marland Oil Co. of Delaware, to organize a company on his own behalf.

Dr. HORACE C. PORTER spoke before the Franklin Institute, Dec. 17, on "Low-Temperature Coal Carbonization and Its Prospective Industrial Application."

GEORGE M. ROLPH, general manager of the California & Hawaiian Sugar Refining Corporation, San Francisco, Calif., has returned to that city from a trip to Hawaii.

Dr. J. J. RUTLEDGE, chief of the Maryland State Bureau of Mines, gave a talk before the members of the Baltimore Section of the American Society of Mechanical Engineers, Dec. 10, dealing with the activities of the bureau.

Dr. E. G. SCHMIDT (Wisconsin 1924) has become associated with the Commercial Solvents Corporation, Terre Haute, Ind., in the capacity of research chemist.

S. W. STRATTON, president of the Massachusetts Institute of Technology, has left the Garfield Memorial Hospital, Washington, D. C., recovering from an operation recently performed there. He will remain at Washington a few weeks, or until he is able to resume his duties at the Institute.

Dr. WALLACE H. STROUD, chief chemist of the Wisconsin Department of Agriculture for the past 10 years, during which time he was in charge of the feed and fertilizer inspection service, has resigned in order to accept a position as secretary of the Soft Wheat Millers Association, with headquarters at Nashville, Tenn. He will assume his new duties the first of the year.

G. M. TUCKER, ceramic engineer of the New York Architectural Terra Cotta Co., Long Island City, has been elected vice-president and director of the Ceramics Products Corporation, Old Bridge, N. J. He will retain his connection with the first noted organization.

Dr. EDGAR T. WHERRY of Washington, D. C., formerly a professor at Lehigh University, Bethlehem, Pa., spoke before the members of the Lehigh Valley Section of the American Chemical Society, Dec. 12, in the chemical lecture room at the university, on "Soil Activity and Its Influence on Plant Growth."

At the meeting of the board of directors of the American Petroleum Institute, Dec. 11, the following officers were elected for the ensuing year: President, J. Edgar Pew; vice-president, Edward Prizer; vice-president, E. W. Clark; vice-president, Frank Phillips; treasurer, A. L. Beaty; secretary and general counsel, Robert L. Welch; assistant secretary and counsel, W. R. Boyd, Jr., and assistant treasurer, Lacey Walker. At the same meeting the following members of the executive committee were named: J. Edgar Pew, E. W. Clark, A. L. Beaty, W. N. Davis, George S. Davison, E. C. Lufkin, Edward Prizer, Frank Phillips, A. C. Bedford, Robert W. Stewart, H. L. Doherty and Thomas A. O'Donnell.

At the annual meeting of the National Glass Distributors Association, Pittsburgh, Pa., Dec. 11, John N. Carey, Indianapolis, Ind., was elected president for the ensuing year, succeeding E. V. Jacka. W. J. Schoonover, Scranton, Pa., was elected vice-president; and North Storms, of Chicago, Ill., was re-elected secretary and treasurer.

Obituary

A. W. CLARK, director of the welfare department of the General Electric Co., Schenectady, N. Y., died in the Ellis Hospital, in that city, Dec. 9, following a week's illness of pneumonia. He was born at Petersham, Mass., in 1876, and had been connected with the welfare department of the company since 1912.

Synthetic Organic Chemical Makers Elect Officers

At the annual meeting of the Synthetic Organic Chemical Manufacturers Association of the United States held in New York City on Dec. 12 the following officers were elected:

President, Charles H. Herty, New York; treasurer, F. P. Summers, Noil Chemical & Color Works, New York; vice-presidents: August Merz, Heller & Merz Co., Newark, N. J. (Dyestuffs Section); S. W. Wilder, Merrimac Chemical Co., Boston, Mass. (Crudes and Intermediates Section); R. E. Dorland, Dow Chemical Co., New York City (Fine Organic and Medicinal Chemicals Section); P. S. Rigney, Roessler & Hasslacher Chemical Co., New York (Special Chemicals Section); board of governors: Charles H. Herty, ex officio, New York City; August Merz, vice-president, Newark, N. J; S. W. Wilder, vice-president, Boston, Mass.; R. E. Dorland, vice-president, New York City; P. S. Rigney, vice-president, New York City; A. B. Burdick, (Fine Organic and Medicinal Chemicals Section), Chicago, Ill.; A. J. Farmer (Dyestuffs Section), New York City; W. F. Harrington (Crudes and Intermediates Section), Wilmington, Del.; E. H. Killheffer (Dyestuffs Section), Passaic, N. J.; A. V. H. Mory (Special Chemicals Section), New York City; F. P. Summers (Dyestuffs Section), New York City; B. R. Tunison (Fine Organic and Medicinal Chemicals Section), New York City; R. N. Wallach (Crudes and Intermediates Section), New York City; William S. Weeks (Crudes and Intermediates Section), Bound Brook, N. J.; G. H. Whaley (Dyestuffs Section), New York City.

Market Conditions

Quiet Trading Reported for Chemicals and Allied Products

Approach of Inventory Period Slows Up Buying Activity—Weighted Index Number Again Advances

THERE has been some slowing up in call for delivery of chemicals against contracts. Consumers, also, have operated less actively in the spot market and quiet markets are looked for until after the inventory period. Placing of orders for future delivery has not been active but this was to be expected in view of the large contract business which had been placed in previous weeks and which went a long way to take care of future consuming requirements.

Reports from the various consuming industries are generally favorable and operations during the first quarter of next year promise to show healthy expansion over the last quarter of the present year, with a consequent gain in consumption of raw materials.

Sharp rises in values for crude cottonseed oil combined with higher markets for linseed oil and miscellaneous chemicals, brought about a material uplift in the weighted index number for the week. The number was reported at 160.23 as compared with 158.22 for the preceding week and 164.94 for the corresponding week of 1923. Important basic chemicals are not subject to frequent price changes but are in a steady position and this holds true of most chemical selections with an easy tone found in a few cases where domestic products continue to find keen competition from foreign markets.

There has been no sign of weakness in the metal markets and the metal salts are in a correspondingly firm position. The advance in prices for lead oxides as announced in the preceding week has been followed by another rise of one-half cent per lb. and carbonate and sulphate of lead were included in the advance. Higher selling prices appear to be in prospect for some of the other metal salts.

It was announced during the week that the Tariff Commission had secured information regarding sales and prices for domestic dyes and coal-tars for the first 9 months of the year and would soon send a questionnaire to manufacturers in order to secure similar data for the last quarter of the year, during which period the lower import tariff was in effect. This may be significant as a preliminary step to bring about a change in the present tariff schedule.

Acids

The position of oxalic acid has attracted considerable attention because of the long-continued competition between the foreign and domestic products. Reports have been current that producers abroad were firmer in their views and would ask higher prices for future deliveries. So far these reports have not been verified and quotations for shipment have been lower than those asked for spot holdings. Imported formic acid also has been freely offered at low prices both on spot and for shipment with supply apparently in excess of demand. Citric and tartaric acids have been steady and if the expected demand sets in for early 1925 shipments, the probabilities favor higher selling prices. Lactic acid is free from foreign competition and as buying has been heavy enough to absorb offerings, the market is in a strong position. Acetic acid has been moving rather freely and values are maintained at quotation levels. There were no important developments last week in the market for mineral acids. New business continues to come forward in fair volume and contract orders are large so that a heavy consumption is assured.

Acetone Easier—Lead Oxides Again Advanced — Basic Carbonate of Lead Higher—Formic Acid Easy—Prussiate of Soda Firmer — Lactic Acid Steady—Carbon Tetrachloride in Better Demand—Slow Call for Arsenic—Oxalic Acid Unsettled—Firm Market for Calcined Carbonate of Potash

Potashes

Carbonate of Potash—Calcined carbonate of potash has been firmly held with spot holdings greatly reduced as a result of recent buying. The limited amount of 80-85 per cent carbonate on spot has placed quotations in a nominal position and trading has been practically held to future deliveries. Shipments were quoted at 6c. per lb. with a possibility that round lots could be obtained at a fractional discount. Spot holdings of 96-98 per cent were firm with 6@6½c. per lb. asked. Hydrated 80-85 per cent is in fair supply and with buying quiet, is offered at 5@5¼c. per lb.

Caustic Potash—Only moderate interest has been shown in this chemical but the market has held steady and foreign caustic is quoted at 7¼c. per lb. for spot and shipment. While domestic goods are offered at 7½c. per lb., at works, the foreign-made product is influenced by strength in markets abroad.

Nitrate of Potash—Arrivals of foreign nitrate have been noted with regularity and values are said to have been irregular with some difference in price according to seller. Consuming demand is reported as about normal. Prices are given at 6@6¼c. per lb. for granulated, 7@7¼c. per lb. for powdered, and 7@8c. per lb. for crystals.

Permanganate of Potash — A quiet week was reported for permanganate. Imported material was said to be offered at concessions but 14½c. per lb. was asked by most holders with the range extending up to 15c. per lb. according to seller and quantity. Domestic permanganate is about in line with the imported.

Prussiate of Potash — While most sellers were asking 16½c. per lb. for yellow prussiate, shipment from abroad, it was stated that bids of 16¼c. per lb. would be accepted. The asking price for spot prussiate appeared to be firm at 16¾c. per lb. Demand was quiet for all positions. Red prussiate was moving slowly with spot quotations at 37½@38c. per lb. and shipments at 37c. per lb.

Sodas

Acetate of Soda—Recent buying has been moderate and stocks at works are said to have gained in volume. As a result of the slower trading movement the market has shown an easier tendency and the carlot quotation of 5c. per lb. at works is said to be easy with a possibility of securing slight concessions for prompt shipment.

Bichromate of Soda—While a large volume of contract business has been placed in the past few months, the position of the market has not been satisfactory to all producers. Prices have fallen to levels lower than have ruled for some years and the opinion is advanced that present values will give way to higher price levels in the future. The low prices have attracted inquiries for export and some good sized orders are reported to have been booked. Open market quotations show a range according to seller with 6¼@6½c. per lb. given in different quarters but business is placed largely on private terms and prices in some cases have not shown the usual differentials according to quantity.

Caustic Soda—Export inquiry was less active but the situation is said to be improved as far as prices are concerned and $2.90@$2.95 per 100 lb. is quoted for outside brands with standard makes quoted up to $3.10 per 100

lb. Detailed figures for October exports show shipments of 1,462,491 lb. to Cuba, 1,461,683 lb. to Japan, 1,168,335 lb. to Brazil, 911,690 lb. to Argentina, 806,342 lb. to Mexico, 803,591 lb. to Canada, and 455,905 lb. to Italy. The remainder of the 8,742,418 lb. exported in that month was distributed in small lots among various countries. Domestic business was light during the week. Contract prices hold at $3.10 per 100 lb. for solid 76 per cent, carlots, at works, and spot cars at $3.20 per 100 lb. at works.

Nitrate of Soda—Shipments of nitrate from Chile in November are reported at 213,000 tons, of which 140,000 tons were for Europe. Reports from the United Kingdom say that while shipments from Chile have been large, demand is not active and stocks are large. Market prices in domestic markets have been firm, with the strong position of exchange a factor in steadying values. Spot nitrate is quoted at $2.47½ per 100 lb. with later deliveries commanding a premium.

Nitrite of Soda — Consumers have been receiving deliveries against contracts and demand for spot nitrite has eased off. The market is hardly steady and the asking price of 9¼c. per lb. for spot goods can be shaded on firm business. Domestic nitrite is not plentiful but forward positions are offered freely and contract business has been heard as low as 8½c. per lb.

Prussiate of Soda — Asking prices for imported prussiate for shipment were higher, with 9½c. per lb. given as an inside figure. The advance in forward positions had a strengthening effect on spot values and sales were made at 9⅝c. per lb. The latter involved moderate sized lots and it was stated that round lots could probably be bought at 9¼c. per lb.

Miscellaneous Chemicals

Acetone—Producers of some grades of acetone have been competing for business and prices have suffered as a result of selling pressure. On carload lots, there were sellers at 14c. per lb. with smaller lots commanding the usual premiums. Other producers were not meeting these prices and the unchanged position of acetate of lime held quotations for acetone at 16@17c. per lb.

Carbon Tetrachloride—Improved demand in recent weeks has placed sellers in a more favorable position and selling pressure has been less in evidence. Sales have been made at prices higher than were in effect a short time ago and 6¾c. per lb. is generally regarded as the lowest price of sellers with a range upward on a quantity basis.

Sulphur—Shipments from producing centers are reported to be large. In addition to a good call from domestic users, there has been a large volume of business placed for export. Prices are quoted at $18@$20 per ton f.a.s. New York and at $16@$18 at works.

Copper Sulphate—The metal market was higher, electrolytic copper selling in a large way at 14⅞c. per lb., first-quarter delivery. But this brought out no change in the copper sulphate situation, except to steady the ideas of some sellers regarding futures. The demand was slow at all times and prices on the domestic product ranged from 4.35@4.65c. per lb., according to quantity and seller.

Sal Ammoniac—There was no change in the domestic product, shipments against old contracts being fairly large and prices steady. White granular, domestic 7@7½c. per lb. Imported material offered freely at 5¾@6c. per lb., immediate delivery, and at 5¾c. per lb., forward shipment from the other side.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	160.23
Last week	158.22
Dec., 1923	165.00
Dec., 1922	164.00
Dec., 1921	145.00
Dec., 1920	189.00
Dec., 1919	245.00
Dec., 1918	277.00

A general advance in lead salts, linseed oil and cottonseed oil resulted in a higher weighted index number. Compared with a week ago the index advanced 201 points. A decline occurred in acetone.

Alcohol

With a firm situation on most of the raw materials and demand fairly active the undertone of the market for denatured alcohol was strong in all quarters, although no revision in prices was announced. Spot stocks are scanty and second hands have been sellers at a premium. Special denatured, formula No. 1, in drums, held at 55@55½c. per gal., carload lots, nearby delivery.

Methanol was inactive and prices in some quarters were unsettled. On the 95 per cent material, in drums, first hands quote 70@72c. per gal., carload basis, with the 97 per cent material at 72@74c. per gal. Pure methanol, in tank cars, works, held at 74c. per gal.

Coal-Tar Products

Production of Byproduct Coke Shows Moderate Increase for November—Crudes Steady—Aniline Oil Firm—Pyridine Easy

PRODUCTION of byproduct coke in November, according to the Geological Survey, was 2,929,000 net tons, which compares with 2,899,000 net tons in October, an increase of 4.4 per cent. The plants were operated at 77.3 per cent of capacity. Of the 75 plants in the country 68 were in operation. Total production of coke in November was 3,559,000 tons, indicating that 630,000 tons were produced in beehive ovens. Compared with 1923 the present rate of output shows a decrease of 25 per cent. Further expansion in byproduct coke oven operations was reported for the first half of December, but stocks of crudes were not augmented sufficiently to bring about a change in the situation. In benzene the supplies are moderate and prices steady. Xylene was offered more freely in some directions. The call for phenol has been good, but no scarcity exists and some sellers appeared more anxious for business. Demand for aniline oil continues fairly active and sellers' ideas are firm. Importations of pyridine have been larger, resulting in selling pressure on odd lots and irregularity in prices. Naphthalene was quotably unchanged, leading makers taking a firm view regarding the near future; trading quiet.

Aniline Oil and Salt—Demand for aniline oil reported improving and prices are firmer, though quotably unchanged. Last sales of aniline oil 16c. per lb., drums extra, works. Aniline salt quiet and prices nominal, ranging from 22@23c. per lb.

Benzene—There has been a moderate gain in actual production, but, with no accumulation in supplies, the market has retained its firm undertone. Producers say that demand keeps up well for this season of the year. Prices held at 23c. per gal. on the 90 per cent grade and 25c. on the so-called pure, tank cars, f.o.b. works.

Creosote Oil — English markets firmer, some sellers asking 6d. per gal., bulk basis, f.o.b. point of production. In other directions there were offerings of the coal-tar product at 5¾d. per gal. Inquiry reported from America.

Diethylaniline — First hands quote 60@61c. per lb., indicating that the market is in a firmer position.

H-Acid—Some improvement in business, but keen competition a factor and prices range from 70@72c. per lb.

Naphthalene—No important buying was reported in naphthalene, but prices held fairly steady. Prices named on forward business do not look attractive to buyers and this, in part, accounts for the quiet prevailing. On the other hand sellers are firm in their views, believing that there will be no great surplus on the market when the buying season sets in. Refined flake held at 5½c. per lb., all positions. Chipped material was nominal at 4½@4¾c. per lb. Crude, to import, 2c. per lb., c.i.f. New York. A shipment of crude arrived here last week.

Phenol—Leading makers maintained prices at 24@25c. per lb., in drums, reporting the market as steady. Some resale material sold at slight concessions. Demand for spot material inactive. Shipments against contracts good, phenolic resin makers taking large quantities.

Pyridine — Spot material sold at $3.75c. per gal., indicating that prices have softened. Imports larger, while demand has fallen away considerably.

Xylene—Offerings more liberal and prices at the close were unsettled. On the 5 per cent material there were sellers at 36@40c. per gal.

Vegetable Oils and Fats

Higher Market for Crude and Refined Cottonseed Oil—Linseed Oil Strong—China Wood Oil Firmer—Tallow Again Advances

THE tendency of prices for vegetable oils was upward, new highs for the season obtaining for crude and refined cottonseed, crude corn, palm and linseed oils. Consumer buying was in evidence, but this was not particularly brisk. Speculative activity in refined cottonseed oil broadened considerably and sent prices sharply higher, especially in the distant options. Strength in lard again was a factor. The advance in domestic linseed oil revived buying interest in foreign material. Continued strength in tallow steadied prices for all of the palm oils. Soap makers bought several round lots of tallow at higher prices.

Cottonseed Oil—Crude oil was purchased by refiners and compound makers in a fairly large way at prices ranging from 9¾@10c. per lb., tank cars, f.o.b. mills, an advance of ⅛c. per lb. for the week. Against these purchases of crude refiners sold the options in the New York market, the differential between crude and refined oil being 220@240 points. Refined oil advanced sharply on the upturn in pure lard, which inspired heavy buying on the part of the speculative element. Most of the trading in refined oil took place in the May option. A good deal of January and March oil was switched to the more distant positions. On Thursday the December option settled at 11.50@11.65c. per lb., with January at 11.60@11.65c. per lb., and May at 12.18@12.20c. per lb. At the same time cash lard, in Chicago, stood at 16.70c. per lb., and May lard at 17.05c. per lb. The spread between May oil and lard was 487 points. Cash demand for oil was less active in the past week, and the same could be said of lard compound. Domestic trade in pure lard was fair, but export business was rather slow. Lard compound was advanced to 13¾@14c. per lb., in bbl., carload lots. The final crop report places the total yield of cottonseed at 5,840,000 tons, which figuring on a normal crush, should yield approximately 3,100,000 bbl. of refined cottonseed oil.

Linseed Oil—The seed markets in the Northwest advanced from 15@18c. per bu. in the past week, which was followed by an advance in linseed oil prices amounting to 4@5c. per gal. The demand for seed was active, crushers competing for the smaller offerings. Speculative buying interest also was apparent. News from the Argentine was no better, rains hindering harvesting operations in some sections. American crushers located on the seaboard showed more willingness to take on Argentine seed, the South American market going to a discount for the first time in months. Buenos Aires quoted February seed at $2.28¼ per bu. The final crop report on the domestic outturn placed the yield at 30,173,000 bu., which was very much in line with expectations. Crushers now feel that this country will have to import between 8,000,000 and 10,000,000 bu. of seed before our next harvest. Should the Argentine produce less than 53,200,000 bu. of seed, the official estimate, competition for supplies should be keen, as Europe and the United Kingdom alone took more than 42,000,000 bu. of the 1923-24 crop. Duluth quoted December seed at $2.97¼ and May at $2.99⅛ per bu. The market for linseed oil settled at $1.13@$1.14 per gal., carload lots, cooperage included, December-February delivery, with March-April at $1.16@$1.17 per gal., and May-June at $1.18@$1.19 per gal. Demand for oil was good early in the week, but slackened after the advance became general. Several lots of foreign oil were purchased at prices ranging from $1.04@$1.06 per gal., cooperage basis, c.i.f. New York.

Flaxseed Output for 1924 Placed at 30,173,000 Bu.

In the final crop report for the 1924 season the Department of Agriculture estimates the yield of flaxseed at 30,173,000 bu., which compares with 17,060,000 bu., the revised estimate for 1923, and 10,375,000 bu., the output for 1922. The November report indicated a yield of 30,652,000 bu. The slight reduction in the final report was brought about by a revision in the acreage figures. The area sowed, according to the final estimate, was 86,000 acres smaller than previously reported.

Final acreage and yield for the past 5 years follows:

	Acres	Bushels
1924	3,289,000	30,173,000
1923	2,014,000	17,060,000
1922	1,113,000	10,375,000
1921	1,108,000	8,029,000
1920	1,757,000	10,774,000

China Wood Oil—Inquiry was better, inspired in part by the strong market for linseed oil. For spot material in cooperage holders now ask from 15¾@16c. per lb., with futures at 15½c. per lb. On the Pacific coast 14c. was the nominal quotation for oil in tank cars, January-February shipment.

Corn Oil—Crude oil sold at 10⅛c. per lb., prompt shipment from Chicago. Later bids at 10¼c. were turned down. The offerings were light.

Coconut Oil—Offerings of spot oil in cooperage were small and prices firm, holders asking from 11⅛@11⅜c. per lb. On tank cars for December delivery quotations held at 10¼@10⅜c. per lb. for the Ceylon type oil. On the coast prompt shipment oil held at 9⅞c. asked, with early 1925 at 9⅝c. per lb., tank car basis. Trading was not active, but the undertone was firmer.

Olive Oil Foots—Sales took place at 9¾@10c. per lb., the market being firm on smaller offerings from abroad and improved buying here.

Palm Oils—The strength in tallow caused holders to raise their prices for spot and nearby material. Lagos oil on spot settled at 9⅞c., with futures nominal at 9⅝c. per lb. Niger on spot was nominal at 9c. per lb., with futures at 8⅝@8¾c. per lb., according to position.

Palm Kernel Oil—There were offerings of English oil for shipment from abroad at 10⅛c. in casks and 10¼c. per lb., in bbl., c.i.f. New York.

Rapeseed Oil—Refined oil on spot was available at 97c. per gal., in bbl. Japanese oil for future delivery was offered at concessions.

Soya Bean Oil—Crude oil for shipment from the Orient in bulk was offered at 8.25c. per lb., in bond, c.i.f. San Francisco. For oil in tank cars, duty paid, January-February shipment from the Pacific coast, the market settled at 11¼@11⅜c. per lb.

Tallow, Etc.—Soap makers bought 1,250,000 lb. of extra special tallow at 10⅛c. per lb., an advance of ¼c. Oleo stearine sold at 11⅞c. per lb., a decline of ⅛c.

Miscellaneous Materials

Antimony — Chinese material available on spot at 14¼c. per lb., a decline of ⅛c. Chinese needle, lump, nominal at 10c. per lb. Standard needle, powdered, 200 mesh, 11⅛c. per lb. White oxide, Chinese, 99 per cent, 13@14c. per lb.

Barytes—Crude was offered for shipment from South Carolina at $6.50@$8 per gross ton. Ground, off color, $13 per ton and white bleached at $17 per ton, f.o.b. South Carolina. Water ground, 300 mesh, in bags, offered at $21 per ton, Charlotte, N. C. White floated, f.o.b. St. Louis, steady at $23@$24 per ton.

Carbon Gas Black—The market has been unsettled on forced selling by some holders, but traders now report improved conditions and steadier prices. Leading factors quote 6@8c. per lb., in bags, contract deliveries, f.o.b. works. Spot material, in cases, nominal at 10c. and upward, according to grade.

Naval Stores — Demand was quiet here, but more active in the South. Turpentine for immediate delivery was steady, closing at 84@85c. per gal., in bbl. There was a fair inquiry for rosins, the market on the lower grades settling at $7.60@$7.70 per bbl.

Glycerine — Chemically pure offered at 19c. per lb., in drums. Dynamite sold recently at 17¾c. per lb., in drums, carload lots, f.o.b. point of production, Middle West. Crude soap lye, nominal at 12c. per lb., loose, f.o.b. point of production. Market firmer.

Lead Pigments—Corroders announced an advance of ¼c. per lb. on white lead, red lead, litharge and orange mineral. The uplift reflected a higher market for the metal. The official contract price for pig lead was advanced to 9.35c. per lb. on Dec. 1. Stocks are light and demand active. The call for lead pigments has been satisfactory and corroders expect to move a larger tonnage next year.

Imports at the Port of New York

December 12 to December 18

ACIDS—Cresylic—1 dr., Liverpool, Monsanto Chemical Works; 12 dr., Liverpool, Order. **Formic**—100 carboys, Rotterdam, E. M. Sergeant Co.; 140 carboys, Rotterdam, R. W. Greeff & Co. **Lactic**—1 cs., Hamburg, Order. **Oxalic**—38 csk., Hamburg, Seaboard National Bank; 5 bbl., Hamburg, Order; 12 csk., Rotterdam, Order. **Phenol**—40 dr. crystals, Liverpool, Order. **Boracic**—200 bg., Leghorn, Pacific Coast Borax Co.

ALBUMEN—34 cs., Shanghai, Importers Commission Co.

AMMONIUM BROMIDE—10 cs., Hamburg, Order.

AMMONIUM NITRATE—97 csk., Hamburg, Kuttroff, Pickhardt & Co.

AMYL ACETATE — 15 dr., Hamburg, East River National Bank.

ANTIMONY REGULUS—500 cs., Hamburg, Order; 150 cs., London, A. H. Pickering & Co.

ANTIMONY SALTS—50 bbl., Hamburg, Roessler & Hasslacher Chem. Co.; 11 csk., London, L. H. Butcher Co.; 7 csk. sulphuret, London, Order; 200 csk. sulphuret, Bordeaux, Heemsoth, Basse & Co.

ANTIMONY ORE—563 bg., Antofagasta, W. R. Grace & Co.

ARSENIC SULPHIDE—20 csk. yellow, London, L. H. Butcher Co.

ASBESTOS — 2,140 bg., Cape Town, Standard Bank of S. A.

BARIUM CHLORIDE — 42 bbl., Hamburg, A. Klipstein & Co.

BARIUM NITRATE — 29 bbl., Hamburg, Roessler & Hasslacher Chem. Co.

BARYTES—1 lot (in bulk), Rotterdam, Ore & Chemical Corp.

CALCIUM CHLORIDE—204 dr., Hamburg, Order.

CAMPHOR — 150 cs. crude, Keelung, Eastman Kodak Co.; 100 cs. do., Shanghai, Market Street National Bank; 91 cs., Hamburg, Order; 168 cs., Shanghai, D. L. Moss & Co.; 220 cs., Hamburg, Equitable Trust Co.

CASEIN—417 bg., Buenos Aires, West Virginia Pulp & Paper Co.; 1,250 bg., Buenos Aires, Bank of the Manhattan Co.; 1,667 bg., Buenos Aires, Bank of America; 1,301 bg., Buenos Aires, National City Bank.

CHALK — 500 bg., Antwerp, L. H. Butcher & Co.; 69 csk., Hamburg, International Ultramarine Works; 500 tons, London, Taintor Trading Co.; 275 bg., Bristol, H. J. Baker & Bro.; 2,000 bg., Antwerp, National City Bank.

CHINA CLAY — 535 bg., Bristol, National City Bank; 200 bg., Bristol, J. Lee Smith & Co.; 150 tons, Bristol, Papermakers Importing Co.; 599 tons, Bristol, Moore & Munger; 228 bbl., Bristol, Order.

CHEMICALS — 16 cs., Hamburg, Agfa Products, Inc.; 200 bg. and 10 cs., Hamburg, Order; 2 cs., Hamburg, National American Bank; 13 cs., Hamburg, G. Gennert; 13 cs., Hamburg, Eimer & Amend; 46 pkg. Hamburg, Pfaltz & Bauer; 173 pkg., Rotterdam, Roessler & Hasslacher Chem. Co.; 200 bg., Rotterdam, A. Klipstein & Co.; 145 csk., Rotterdam, Order; 11 pkg., Rotterdam, Grasselli Dyestuff Corp.; 2 bbl., Hamburg, Fezandie & Sperrle; 2 csk. and 45 cs., Hamburg, Order; 200 csk., Bordeaux, Order.

CHROME ORE—500 tons, Madras, Order; 750 tons, Beira, E. J. Lavino & Co.

COAL-TAR DISTILLATE — 25 dr., Liverpool, Monsanto Chemical Works; 96 dr., Liverpool, Order.

COLORS — 6 csk. aniline, Hamburg, Franklin Import & Export Co.; 31 csk. do., Hamburg, Kuttroff, Pickhardt & Co.; 11 csk., Hamburg, H. R. Jahn; 39 pkg. aniline, Havre, Ciba Co.; 6 csk., Havre, W. F. Sykes & Co.; 12 cs. bronze, Bremen, L. Uhlfelder; 40 csk., Bremen, Heller & Merz; 80 csk. earth, Rotterdam, Reichard-Coulston, Inc.; 2 csk., Hamburg, American Aniline Products Co.; 3 pkg., Hamburg, H. A. Metz & Co.; 14 csk., Hamburg, National City Bank; 4 bbl., Antwerp, Irving Bank-Col. Trust Co.; 2 kegs, Antwerp, Order.

CREAM TARTER—30 csk., Hamburg, A. J. Marcus, Inc.

CREOSOTE—30 dr., Liverpool, Panama Pacific Co.

EPSOM SALT—500 bg., Hamburg, Seaboard National Bank; 500 bg., Hamburg, C. Tennant Sons & Co.; 500 bg. and 400 csk., Hamburg, Brown Bros. & Co.

FILTER PAPER—25 bl., Bordeaux, Angel H. Reeve & Co.

FUSEL OIL—24 dr., Hamburg, Order; 51 dr., Hamburg, Schenkers, Inc.

FULLERS EARTH—500 bg., Bristol, L. A. Salomon & Bro.

GLYCERINE—38 dr. crude, Havana, Harshaw, Fuller & Goodwin.

GLAUBER SALTS—175 bbl., Hamburg, Seaboard National Bank; 246 bbl., Hamburg, E. M. Sergeant & Co.; 334 bg., Hamburg, American Exchange National Bank.

GLUE—268 bg., Hamburg, Order.

GRAPHITE—1,500 bg., Tsingtao, Mitsui Bussan Kaisha.

GUMS—44 bg. copal, Antwerp, Equitable Trust Co.; 251 bg. arabic, Port Sudan, T. M. Duche & Sons; 321 bg. copal, Antwerp, Chemical National Bank; 300 cs. damar, Batavia, Goldman, Sachs & Co.; 100 cs. do., Batavia, Kidder, Peabody & Co.; 300 cs. do., Batavia, Innes & Co.; 600 cs. do., Batavia, Order; 189 bskt. copal, Macassar, Standard Bank of South Africa; 880 pkg. do., Macassar, Kidder, Peabody & Co.; 386 pkg. do., Macassar, Catz American Corp.; 529 pkg. do., Macassar, Equitable Trust Co.; 261 pkg. do., Macassar, Mechanics & Metals National Bank; 252 pkg. do., Macassar, France, Campbell & Darling; 130 pkg. do., Macassar, L. C. Gillespie & Son; 260 pkg. do., Macassar, Patterson, Boardman & Knapp; 52 pkg. do., Macassar, G. H. Links; 1,241 pkg. do., Macassar, Order; 276 cs. damar, Singapore, Order.

IRON CHLORIDE—50 bbl., Hamburg, J. Munroe & Co.

IRON OXIDE—40 bbl., Malaga, L. H. Butcher & Co.; 100 bbl., Malaga, E. M. & F. Waldo; 100 bbl., Malagia, S. L. Libby Co.; 114 bbl., Malaga, C. J. Osborn Co.; 151 bg., Malaga, C. W. Williams & Co.; 26 csk., Liverpool, J. A. McNulty; 2 csk., Liverpool, Bank of America; 35 csk., Liverpool, R. J. Waddell & Co.; 75 pkg., Bristol, G. Z. Collins & Co.; 28 csk., Bristol, Order.

KAOLIN—400 bg., Hamburg, Lunham & Moore.

LITHOPONE—50 csk., Rotterdam, Brown & Roese.

LOGWOOD EXTRACT—110 bbl., Cape Haitien, Logwood Mfg. Co.; 30 csk., Kingston, West Indies Chemical Works; 240 cs., Kingston, J. W. Fisher.

MAGNESIUM CHLORIDE—100 bg., Hamburg, A. Klipstein & Co.

MAGNESIUM POWDER—6 cs., Hamburg, Elektron Metals Corp. of Am.

MAGNESITE—7,460 bg., Madras, Order.

MANGANESE SULPHATE—88 bbl., Hamburg, Roessler & Hasslacher Chemical Co.

NAPTHALENE—126 bg. crude, London, E. M. Sergeant & Co.

OCHER—72 csk., Marseilles, American Exchange National Bank; 125 csk., Marseilles, Scott, Libby Corp.; 155 csk., Marseilles, Order; 125 csk., Marseilles, Order.

OILS—Coconut—2,581,749 lb., Manila, Munn & Jenkins. **China Wood**—500 bbl., Shanghai, Mitsui & Co.; 150 bbl., Shanghai, P. I. Fagan; 450 bbl., Shanghai, Order. **Cod**—300 csk., St. Johns, National Oil Products Co. **Palm Kernel**—207 bbl., Liverpool, E. F. Jones Chemical Co.; 105 csk., Liverpool, African & Eastern Trading Co.

PALM—233 csk., Hamburg, African & Eastern Trading Co.; 420 csk., Abonnama, Irving Bank-Col. Trust Co.; 336 csk., Burutu, Irving Bank-Col. Trust Co.; 72 bbl. and 4 dr., Antwerp, Elbert & Co.; 154 csk., Hamburg, African & Eastern Trading Co. **Perilla**—500 bbl., Dairen, Cook & Swan Co.; 250 bbl., Kobe, Cook & Swan Co.

OILSEEDS—Copra—556 tons (at San Francisco), Manila, Order; 618 bg., Trinidad, Order.

PITCH—300 bbl., Hamburg, Order.

POTASSIUM SALTS—30 csk., sulphite, Hamburg, A. J. Marcus, Inc.; 50 cs., bromide, Hamburg, Seaboard National Bank; 750 csk. chlorate, Hamburg, Seaboard National Bank; 400 bbl. alum, Hamburg, Order; 66 bbl. alum, Hamburg, Cooper & Cooper; 30 csk. carbonate, Hamburg, Parsons & Petit; 2,000 csk. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 101 bbl. alum, Hamburg, Order; 20 cs. bromide, Hamburg, Order; 7,540 bg. muriate and 1 lot manure salt (in bulk), Bremen, Potash Importing Corp. of America; 10 kg. binoxalate, Rotterdam, R. W. Greeff & Co.; 254 bg. nitrate, Rotterdam, Kuttroff, Pickhardt & Co.; 98 cs. bromide, London, Kachurin Drug Co.; 1 cs. nitrate, Iquique, A. Cameron.

PUMICE—3,788 bg. lump, Canneto Lipari, R. J. Waddell & Co.; 4,507 bg., Canneto Lipari, J. H. Rhodes & Co.; 1,270 bg., Canneto Lipari, C. B. Chrystal & Co.; 1,293 bg., Canneto Lipari, Order.

PYRIDINE—1 dr., Hamburg, R. W. Greeff & Co.; 15 dr., Hamburg, Order; 8 dr., Rotterdam, Mechanics & Metals National Bank.

PYRITES—4,313,360 kilos, Huelva, The Pyrites Co.

QUEBRACHO—497 bg. extract, Buenos Aires, Order; 28,039 bg., Buenos Aires, Tannin Corp.; 5,317 bg., Buenos Aires, Order.

QUICKSILVER—450 flasks, Leghorn, Order.

SAL AMMONIAC—13 bbl., Hamburg, Order; 20 csk., Hamburg, Roessler & Hasslacher Chemical Co.; 84 csk., Rotterdam, Seaboard National Bank; 46 csk., Rotterdam, Order.

SHELLAC—50 cs., Hamburg, Rogers-Pyatt Shellac Co.; 50 cs., London, Order.

SILVER SULPHIDE—4 cs., Pacasmayo, W. R. Grace & Co.; 5 cs., Pacasmayo, Bank of Central and South America.

SODIUMM SALTS—13,135 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 6,929 bg. do., Iquique, E. I. duPont de Nemours & Co.; 15,617 bg. do., Iquique, Wessel, Duval & Co.; 100 csk. chlorate, Hamburg, Seaboard National Bank; 100 csk. sulphate, Antwerp, E. Suter & Co.; 79 csk. nitrate, Hamburg, Kuttroff, Pickhardt & Co.; 50 cs. bromide, Hamburg, Order; 625 cs. cyanide, Hamburg, Roessler & Hasslacher Chemical Co.; 224 cs. cyanide, Marseilles, International Banking Corp.; 19 csk. prussiate, Liverpool, Meteor Products Co.; 200 cs. cyanide, Liverpool, Order.

STRONTIUM NITRATE—181 bbl., Hamburg, Meteor Products Co.

STARCH—250 bg. potato, Rotterdam, A. Hoffmann & Co.; 250 bg., Rotterdam, Order.

SUMAC—350 bg. ground, Palermo, New York Trust Co.; 468 bg. do., Palermo, Order.

TALC—700 bg., Bordeaux, Whittaker, Clark & Daniels; 706 bg., Bordeaux, C. B. Chrystal & Co.; 225 cs., Bordeaux, Binney & Smith.

TAR—200 bbl. wood, Danzig, Order.

TARTAR—1,306 bg., Buenos Aires, Royal Baking Powder Co.; 833 bg., Buenos Aires, Bank of London & South America; 1,531 bg., Buenos Aires, Royal Baking Powder Co.; 26 csk., Hamburg, U. S. Navigation Co.; 188 bg., Marseilles, C. Pfizer & Co.; 437 bg., Marseilles, Royal Baking Powder Co.; 577 bg., Buenos Aires, C. Pfizer & Co.; 28 csk., Leghorn, Royal Baking Powder Co.

TETRACHLORATHAN—124 dr., Hamburg, Roessler & Hasslacher Chemical Co.

VANADIUM ORE—1,599 bg., Callao, Vanadium Corp. of America.

WATTLE BARK—729 bg., Durban, Order.

WAXES—8 pkg. beeswax, Azua, Order; 4 bg. do., Santo Domingo, Curacao Trading Co.; 1,125 bg., montan, Hamburg, Strohmeyer & Arpe; 100 cs. vegetable, Kobe, Strohmeyer & Arpe; 17 bg. beeswax, San Antonio, Order; 23 bg. do., Talcahuano, Strohmeyer & Arpe; 16 bg. mineral, Hamburg, L. S. Tainter.

WOOL GREASE—100 bbl., Bremen, Pfaltz & Bauer.

ZINC OXIDE—170 bbl., Antwerp, Innis, Speiden & Co.

ZINC DUST—39 csk., Hamburg, Order.

ZIRCON SAND—1,500 bg., Tuticorin, Travan Core Mineral Co.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are first-hand quotations in the New York market for industrial chemicals, coal-tar products and related materials used in the industries that produce

Dyes	**Paper and Pulp**
Paint and Varnish	**Petroleum**
Ceramic Materials	**Soap**
Fertilizers	**Explosives**
Rubber	**Food Products**
Sugar	**Metal Products**

Whenever available these prices are those of the American manufacturer. If for material f.o.b. works or on a contract basis, quotations are so designated. All prices refer to large quantities in original packages.

Industrial Chemicals

Acetone, drums, works	lb.	$0.14 –	$0.15
Acetic anhydride, 85%, dr	lb.	.36 –	.38
Acid, acetic, 28%, bbl.	100 lb.	3.12 –	3.37
Acetic, 56%, bbl.	100 lb.	5.85 –	6.10
Acetic, 80%, bbl.	100 lb.	8.19 –	8.44
Glacial, 99½%, bbl.	100 lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs	lb.	.45½–	.46½
Formic, 85%	lb.	.10½–	.11
Gallic, tech.	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.13½–	.14
22% tech., light, bbl.	lb.	.06½–	.07
Muriatic, 18° tanks	100 lb.	.80 –	.85
Muriatic, 20°, tanks	100 lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05½
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09½–	.09½
Phosphoric, 50% carboys	lb.	.07½–	.07½
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26 –	.27
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, wks.	lb.	.27 –	.30
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.89 –	.....
Denatured, 190 proof No. 1, special bbl.	gal.	.61 –	.....
No. 1, 190 proof, special, dr.	gal.	.55 –	.....
No. 1, 188 proof, bbl.	gal.	.65 –	.....
No. 1, 188 proof, dr.	gal.	.58 –	.....
No. 5, 188 proof, bbl.	gal.	.60 –	.....
No. 5, 188 proof, dr.	gal.	.55 –	.....
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.02¾–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.45
Iron free, bags	lb.	2.40 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½–	.12¾
Nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	3.50 –	3.75
Antimony oxide, white, bbl.	lb.	.13 –	.14
Arsenic, white, powd., bbl.	lb.	.06½–	.06¾
Red, powd., kegs	lb.	.14¾–	.15½
Barium carbonate, bbl.	ton	54.00 –	55.00
Chloride, bbl.	ton	64.00 –	70.00
Dioxide, 88%, drums	lb.	.17½–	.18
Nitrate, casks	....	.07¾–	.08½
Blanc fixe, dry, bbl.	lb.	.03½–	.03¾
Bleaching powder, f.o.b. wks., drums, contract	100 lb.	1.90 –	.....
Spot, wks., drums	100 lb.	2.00 –	2.15
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.44 –	.45
Calcium acetate, bags	100 lb.	3.00 –	3.05
Arsenate, dr.	lb.	.08 –	.08½
Carbide, drums	lb.	.05 –	.05½
Chloride, fused, dr. wks.	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Phosphate, mono, bbl.	lb.	.06¾–	.07½
Carbon bisulphide, drums	lb.	.06 –	.06½
Tetrachloride, drums	lb.	.06¾–	.07½
Chalk, precip.—domestic, light, bbl.	lb.	.04¼–	.04½
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04¾–	.....
Contract, tanks, wks.	lb.	.04 –	.....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	15.00 –	16.00
Copper carbonate, bbl.	lb.	.17 –	.17½
Cyanide, drums	lb.	.49 –	.50
Oxide, kegs	lb.	.16½–	.16¾
Sulphate, dom., bbl.	100 lb.	4.50 –	4.75
Imp. bbl.	100 lb.	4.50 –	.....
Cream of tartar, bbl.	lb.	.20½–	.21
Epsom salt, dom., bbl.	100 lb.	1.75 –	2.00
Imp., tech., bags	100 lb.	1.35 –	1.40
U.S.P., dom., bbl.	100 lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.15 –	.16
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Acetate, 99%, dr.	gal.	1.08 –	1.10
Formaldehyde, 40%, bbl.	lb.	.09 –	.09½
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.23 –	.....
Fusel oil, ref., drums	gal.	4.50 –	.....
Crude, drums	gal.	3.25 –	3.50
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Imp., bags	100 lb.	.85	.90
Glycerine, c. p., drums extra.	lb.	.19 –	.19½
Crude 80%, loose	lb.	.12 –	.12½
Hexamethylene, drums	lb.	.65 –	.67

Lead:			
White basic carbonate, dry, casks	lb.	$0.11 –	.....
White, basic sulphate, casks	lb.	.10½–	.....
White, in oil, kegs	lb.	.1286–	.....
Red, dry, casks	lb.	.12½–	.....
Red, in oil, kegs	lb.	.1462–	.....
Acetate, white crys., bbl.	lb.	.15½–	.....
Brown, broken, casks	lb.	.14½–	.....
Arsenate, white crys., bbl.	lb.	.16 –	$0.18
Lime-Hydrated, b.g., wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lump, bbl.	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.12½–	.....
Lithopone, bags	lb.	.06 –	.06½
Magnesium carb., tech., bags	lb.	.07 –	.08
Methanol, 95%, drums	gal.	.70 –	.72
97%, drums	gal.	.72 –	.74
Pure, tanks	gal.	.74 –	76
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks	gal.	.70 –	.....
Nickel salt, double, bbl.	lb.	.10 –	...
Single, bbl.	lb.	.10½–	...
Orange mineral, csk.	lb.	.15¾–	.16
Phosgene	...	.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks.	lb.	.08½–	.08½
Bromide, gran., bbl.	lb.	.42 –	.48
Carbonate, 80–85%, calcined, casks	lb.	.06 –	.06½
Chlorate, powd.	lb.	.06¾–	.08½
Cyanide, drums	lb.	.47 –	.52
First sorts, cask	lb.	.08½–	.08½
Hydroxide (caustic potash) drums	lb.	.07½–	.07½
Iodide, cases	lb.	3.65 –	3.75
Nitrate, bbl.	lb.	.06 –	.07½
Permanganate, drums	lb.	.14 –	.15
Prussiate, red, casks	lb.	.36½–	.38
Prussiate, yellow, casks	lb.	.16¾–	.17
Salammoniac, white, gran., casks, imported	lb.	.05¾–	.06
White, gran., bbl., domestic	lb.	.07 –	.07½
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20 –	1.40
Salt cake (bulk) works	ton	16.00 –	18.00
Soda ash, light 58% flat, bulk, contract	100 lb.	1.25 –	.....
bags, contract	100 lb.	1.38 –	.....
Dense, bulk, contract, basis 58%	100 lb.	1.35 –	.....
bags, contract	100 lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	.....
Caustic, ground and flake, contracts, dr.	100 lb.	3.50 –	3.85
Caustic, solid, 76% f.a.s. N. Y.	100 lb.	2.87½–	3.05
Sodium acetate, works, bbl.	lb.	.05 –	.05½
Bicarbonate, bulk	100 lb.	1.75 –	.....
Bichromate, casks	lb.	.06½–	.06½
Bisulphate (niter cake)	ton	6.00 –	7.00
Bisulphite, powd., U.S.P., bbl.	lb.	.04¼–	.04½
Bromide, bbl.	lb.	.43 –	.47
Chlorate, kegs	lb.	.06½–	.06¾
Chloride	long ton	12.00 –	13.00
Cyanide, cases	lb.	.19 –	.22
Flouride, bbl.	lb.	.08¾–	.09
Hyposulphite, bbl.	lb.	.02¼–	.02½
Nitrite, casks	lb.	.09¼–	.09¾
Peroxide, powd., cases	lb.	.23 –	.27
Phosphate, dibasic, bbl.	lb.	.03½–	.03¾
Prussiate, yel. bbl.	lb.	.09¾–	.09½
Salicylate, drums	lb.	$0.38 –	$0.40
Silicate (40°, drums)	100 lb.	.75 –	1.16
Silicate (60°, drums)	100 lb.	1.75 –	2.00
Sulphide, fused, 60-62%, drums	lb.	.02¾–	.03½
Sulphite, crys., bbl.	lb.	.03¼–	.03½
Strontium nitrate, powd., bbl	lb.	.09 –	.09½
Sulphur chloride, yel drums.	lb.	.04½–	.05
Crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Flour, bag	100 lb.	2.25 –	2.35
Dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.15½–	....
Oxide, bbl.	lb.	.58 –	.58½
Crystals, bbl.	lb.	.38½–	.....
Zinc carbonate, bags	lb.	.12 –	.14
Chloride, gran., bags	lb.	.06 –	.07½
Cyanide, drums	lb.	.40 –	.41
Dust bbl.	lb.	.08 –	.08½
Oxide, lead free, bags	lb.	.07¾–	.....
5% lead sulphate bags	lb.	.06¾–	.....
French, red seal, bags	lb.	.09¾–	.....
French, green seal, bags.	lb.	.10¾–	.....
French, white seal, bbl.	lb.	.11¾–	.....
Sulphate, bbl.	100 lb.	3.25 –	3.50

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.62
Alpha-naphthol, ref., bbl.	lb.	.75 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.65 –	.70
Anthraquinone, 25%, drums.	lb.	.65 –	.70
Benzaldehyde U.S.P., tech., drums	lb.	.69 –	.71
Benzene, pure, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl.	lb.	.78 –	.80
Benzyl chloride, ref. carboys.	lb.	.35 –	.....
Benzyl chloride, tech., drums.	lb.	.25 –	.....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresylic acid, 97%, drums	gal.	.62 –	.64
95-97%, drums, works	gal.	.57 –	.59
Dichlorbenzene, drums	lb.	.07 –	.08½
Dinitrobenzene, bbl.	lb.	.15 –	.17½
Dinitrochlorbenzene, bbl.	lb.	.20 –	.21
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
H-acid, bbl.	lb.	.70 –	.74
Meta-phenylenediamine, bbl.	lb.	.90 –	.95
Monochlorbenzene, drums.	lb.	.08½–	.10
Naphthalene, flake, bbl.	lb.	.05 –	.05½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.05 –	1.15
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.10 –	[illegible]
Ortho-toluidine, bbl.	lb.	.17 –	.18
Para-aminophenol, base, kegs	lb.	1.15 –	1.20
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Para-nitraniline, bbl.	lb.	.65 –	.67
Para-nitrotoluene, bbl.	lb.	.40 –	.42
Para-phenylendiamine, bbl.	lb.	1.30 –	1.35
Para-toluidine, bbl.	lb.	.75 –	.80
Phenol, U.S.P., dr.	lb.	.24 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	3.75 –	4.00
Resorcinol, tech., kegs	lb.	1.30 –	1.40
Resorcinol, pure, kegs	lb.	2.00 –	2.25
R-salt, bbl.	lb.	.50 –	.55
Salicylic acid, tech., bbl.	lb.	.32 –	.33
Salicylic acid, U.S.P., bbl.	lb.	.35 –	.....
Solvent naphtha, water-white, tanks	gal.	.24 –	.25
Crude, tanks	gal.	.21 –	.22
Sulphanilic acid, crude, bbl.	lb.	.16 –	.18
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.26 –	.....
Toluene, drums, works	gal.	.31 –	.....
Xylidine, drums	lb.	.40 –	.42
Xylene, 5 deg.-tanks	gal.	.36 –	.40
Xylene, com., tanks	gal.	.24 –	.26

Naval Stores

Rosin B-D, bbl.	280 lb.	$7.55 –	$7.60
Rosin E-I, bbl.	280 lb.	7.55 –	7.60
Rosin K-N, bbl.	280 lb.	7.65 –	7.70
Rosin W.G.-W.W., bbl.	280 lb.	8.65 –	9.20
Turpentine, spirits of, bbl.	gal.	.84 –	.84½
Wood, steam dist., bbl.	gal.	.78 –	.79
Wood, dest. dist., bbl.	gal.	.70 –	.74
Pine tar pitch, bbl.	200 lb.	5.50 –	.....
Tar, kiln burned, bbl.	500 lb.	12.00 –	12.50
Rosin oil, first run, bbl.	gal.	.45 –	.....
Pine tar oil, com'l	gal.	.30 –	.....

Animal Oils and Fats

Degras, bbl.	lb.	$0.03½ – $0.05¾
Grease, yellow, loose	lb.	.09¼ – .09¾
Lard oil, Extra No. 1, bbl.	gal.	.96 – .98
Lard compound, bbl.	lb.	.13½ – 14
Neatsfootoil, 20 deg. bbl.	gal.	1.35 – 1.37
Oleo Stearine	...	.11¾ – .....
Oleo oil, No. 1, bbl.	lb.	.16½ – .16¾
Red oil, distilled, d.p. bbl.	lb.	.11½ – .11¾
Tallow, extra, loose works	lb.	.10½ – .....
Tallow oil, acidless, bbl.	gal.	.92 – .94

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.17 – $0.17½
Castor oil, No. 1, bbl.	lb.	.17½ – .17¾
Chinawood oil, bbl.	lb.	.15¾ – .16¼
Coconut oil, Ceylon, bbl.	lb.	.11½ – .....
Ceylon, tanks, N. Y.	lb.	.10½ – .....
Corn oil, crude, bbl.	lb.	.12½ – .....
Crude, tanks, (f.o.b. mill)	lb.	.10½ – .....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09¾ – .10
Summer yellow, bbl.	lb.	.11¾ – .12
Linseed oil, raw, car lots, bbl.	gal.	1.13 – 1.14
Raw, tank cars (dom.)	gal.	1.07 – 1.08
Boiled, cars, bbl. (dom.)	gal.	1.15 – 1.16
Olive oil, denatured, bbl.	gal.	1.18 – 1.22
Sulphur, (foots) bbl.	lb.	.09½ – .10
Palm, Lagos, casks	lb.	.09¾ – .....
Niger, casks	lb.	.09 – .....
Palm kernel, bbl.	lb.	.10½ – .10¾
Peanut oil, crude, tanks (mill)	lb.	.12 – .12¼
Refined, bbl.	lb.	.16 – .16½
Perilla, bbl.	lb.	.14½ – .14¾
Rapeseed oil, refined, bbl.	gal.	.97 – .98
Sesame, bbl.	lb.	.14¼ – .14½
Soya bean (Manchurian), bbl	lb.	.13½ – .....
Tank, f.o.b. Pacific Coast	lb.	.11¼ – .11¾

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.64 – $0.66
Menhaden, light pressed, bbl.	gal.	.70 – .72
White bleached, bbl.	gal.	.72 – .74
Crude, tanks (f.o.b. factory)	gal.	.53½ – .55
Whale No. 1 crude, tanks, coast	lb.	..... – .....
Winter, natural, bbl.	gal.	.75 – .76
Winter, bleached, bbl.	gal.	.78 – .79

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.50 – $0.55
Albumen, egg, tech, kegs	lb.	.90 – .95
Cochineal, bags	lb.	.33 – .35
Cutch, Borneo, bales	lb.	.04½ – .05
Rangoon, bales	lb.	.13 – .13½
Dextrine, corn, bags 100	lb.	4.52 – 4.79
Gum, bags 100	lb.	4.82 – 5.09
Divi-divi, bags	ton	42.00 – 43.00
Fustic, sticks	ton	30.00 – 35.00
Chips, bags	lb.	.04 – .05
Gambier com., bags	lb.	.19½ – .20
Logwood, sticks	ton	25.00 – 26.00
Chips, bags	lb.	.02½ – .03
Sumac, leaves, Sicily, bags	ton	165.00 – 175.00
Domestic, bags	ton	50.00 – 55.00
Starch, corn, bags 100	lb.	3.87 – 4.14

Extracts

Archil, conc., bbl.	lb.	$0.16 – $0.19
Chestnut, 25% tannin, tanks	lb.	.01½ – .02½
Divi-divi, 25% tannin, bbl.	lb.	.05 – .05
Fustic, liquid, 42°, bbl.	lb.	.08 – .09½
Gambier, liq., 25% tannin, bbl.	lb.	.13½ – .14
Hematine crys., bbl.	lb.	.14 – .18
Hemlock, 25% tannin, bbl.	lb.	.03½ – .04
Hypernic, liquid, 51°, bbl.	lb.	.12 – .13
Logwood, crys., bbl.	lb.	.14 – .15
Liq., 51°, bbl.	lb.	.07½ – .08½
Osage Orange, 51°, liquid, bbl.	lb.	.07 – .08
Quebracho, solid, 65% tannin, bbl.	lb.	.04½ – .04¾
Sumac, dom., 51°, bbl.	lb.	.06½ – .06¾

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.06 – $0.08
spot, cases	lb.	.10 – .15
Lampblack, bbl.	lb.	.12 – .40
Mineral, bulk	ton	35.00 – 45.00
Blues–Prussian, bbl.	lb.	.35 – .37
Ultramarine, bbl.	lb.	.08 – .35
Browns, Sienna, Ital., bbl.	lb.	.05 – .12
Sienna, Domestic, bbl.	lb.	.03 – .03½
Umber, Turkey, bbl.	lb.	.04 – .04½
Greens-Chrome, C.P.Light, bbl.	lb.	.28 – .30
Chrome, commercial, bbl.	lb.	.10½ – .11½
Paris, bulk	lb.	.24 – .26
Reds, Carmine No. 40, tins	lb.	4.25 – 4.50
Iron oxide red, casks	lb.	.08 – .12
Para toner, kegs	lb.	.95 – 1.00
Vermilion, English, bbl.	lb.	1.25 – 1.30
Yellow, Chrome, C.P. bbls.	lb.	.17 – .17½
Ocher, French, casks	lb.	.02 – .03

Waxes

Beeswax, crude, Afr. bg.	lb.	$0.33 – $0.33½
Refined, light, bags	lb.	.36 – .37
Candellila, bags	lb.	.31 – .32
Carnauba, No. 1, bags	lb.	.36 – .37
No. 2, North Country, bags	lb.	.29 – .29½
No. 3, North Country, bags	lb.	.24 – .25
Japan, cases	lb.	$0.15½ – $0.16½
Montan, crude, bags	lb.	.06 – .06½
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.06 – .06½
Crude, scale 124-126 m.p. bags	lb.	.05½ – .05¾
Ref., 118-120 m.p. bags	lb.	.06 – .06½
Ref., 123-125 m.p., bags	lb.	.06½ – .06¾
Stearic acid, sgle. pressed, bags	lb.	.11¾ – .12¼
Double pressed, bags	lb.	.12½ – .12¾

Fertilizers

Acid phosphate, 16%, wks.	ton	$7.50 – $7.75
Ammonium sulphate, bulk f.o.b. works 100	lb.	2.75 – .....
Blood, dried, bulk	unit	3.85 – 3.95
Bone, raw, 3 and 50, ground	ton	26.00 – 28.00
Fish scrap, dom., dried, wks.	unit	4.75 – .....
Nitrate of soda, bags 100	lb.	2.47½ – 2.50
Tankage, high grade, f.o.b. Chicago	unit	3.50 – .....
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.00 – 3.50
Tennessee, 75%	ton	6.50 – 6.75
Potassium muriate, 80%, bags	ton	34.55 – .....
Sulphate, bags, 90%	ton	45.85 – .....
Double manure salt, bgs.	ton	26.35 – .....
Kainit, 14%, bgs	ton	10.25 – .....

Crude Rubber

Para—Upriver fine	lb.	$0.36 – $0.36½
Upriver coarse	lb.	.27 – .27½
Plantation—First latex crepe	lb.	.37¾ – .38
Ribbed smoked sheets	lb.	.37¾ – .38

Gums

Copal, Congo, amber, bags	lb.	$0.08 – $0.10
East Indian, bold, bags	lb.	.13 – .14
Manila, amber, bags	lb.	.14 – .16
Damar, Batavia, cases	lb.	.28 – .28½
Singapore, No. 1, cases	lb.	.29½ – .30
Singapore, No. 2, cases	lb.	.21 – .21½
Kauri, No. 1, cases	lb.	.58 – .64
Ordinary chips, cases	lb.	.21 – .22
Manjak, Barbados, bags	lb.	.06 – .12

Shellac

Shellac, orange fine, bags	lb.	$0.66 – $0.67
Orange superfine, bags	lb.	.68 – .69
Bleached, bonedry	lb.	.73 – .74
T. N., bags	lb.	.63 – .64

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec	sh. ton	$300.00 – $350.00
Shingle, f.o.b., Quebec	sh. ton	45.00 – 50.00
Cement, f.o.b., Quebec	sh. ton	15.00 – 20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	17.00 – 17.50
Grd., off-color, f.o.b., Balt	net ton	13.00 – 14.00
Floated, f.o.b., St. Louis, bbl.	net ton	23.00 – 24.00
Crude f.o.b. mines, bulk	net ton	8.50 – 9.00
Casein, bbl., tech	lb	.10½ – .12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	6.50 – 8.00
Powd., f.o.b. Ga.	net ton	12.00 – 16.00
Crude, f.o.b. Va.	net ton	5.50 – 7.00
Ground, f.o.b. Va.	net ton	10.00 – 20.00
Imp., powd.	net ton	45.00 – 50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.50 – 7.25
No. 2 f.o.b. N.C.	long ton	4.50 – 5.00
No. 1 gr'd. Me.	long ton	19.00 – 20.00
No. 1 Can., f.o.b., mill, powd.	long ton	25.00 – .....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½ – .06
High grade amorphous crude	ton	15.00 – 35.00
Gum arabic, amber, sorts, bags	lb.	.12 – .12½
Tragacanth, sorts, bags	lb.	.50 – .55
No. 1, bags	lb.	1.15 – 1.20
Kieselguhr, f.o.b. Cal.	ton	40.00 – 42.00
F.o.b. N.Y.	ton	50.00 – 55.00
Magnesite, calcined	ton	35.00 – 42.50
Pumice stone, imp., casks	lb.	.03 – .40
Dom., lump, bbl.	lb.	.06 – .08
Dom., ground, bbl.	lb.	.03 – .05
Silica, glass sand, f.o.b. Ind.	ton	2.00 – 2.25
Sand blast, f.o.b. Ind.	ton	2.25 – 3.50
Amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 – .....
Glass sand, f.o.b. Ill.	ton	2.00 – 2.25
Soapstone, coarse, f.o.b., Vt., bags	ton	7.00 – 7.50
Talc. 200 mesh, f.o.b., Vt., bags, extra	ton	10.50 – .....
200 mesh, f.o.b., Ga.	ton	8.50 – 10.00
325 mesh, f.o.b. New York, grade A	ton	14.75 – .....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75 – $2.85
Corning	bbl.	1.50 – .....
Cabell	bbl.	1.45 – .....
Somerset	bbl.	1.55 – .....
Illinois	bbl.	1.37 – .....
Indiana	bbl.	1.38 – .....
Kansas and Okla. under 28 deg.	bbl.	.75 – .85
California, 35 deg. and up	bbl.	1.40 – .....

Gasoline, Etc.

Motor gasoline steel bbls.	gal.	$0.15 – .....
Naphtha, V. M. & P. deod, steel bbls.	gal.	.14½ – .....
Kerosene, ref. tank wagon	gal.	.13 – .....
Bulk, W.W. delivered, N.Y.	gal.	.08½ – .....
Lubricating oils:		
Cylinder, Penn., filtered	gal.	.34 – $0.35
Bloomless, 30@31 grav.	gal.	.24 – .....
Paraffin, pale 885 vis.	gal.	.16½ – .17
Spindle, 200, pale	gal.	.25 – .26
Petrolatum, amber, bbls.	lb.	.04 – .04½
Paraffine wax (see waxes)		

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–$145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	40–43
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	33–37
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48–50
9-in. sizes, f.o.b., Birmingham	1,000	48–50
F.o.b. Mt. Union, Pa.	1,000	33–35
Silicon carbide refract brick, 9-in.	1,000	1,180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls	ton	$200.00 – .....
Ferrochromium, per lb. of Cr, 1-2% C.	lb.	.30 – .....
4-6% C.	lb.	.10½ – .11
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	105.00 – .....
Spiegeleisen, 19-21% Mn.	gr. ton	32.00 – 33.00
Ferromolybdenum, 50-60% Mo, per lb. Mo.	lb.	1.80 – 2.00
Ferrosilicon, 10-12%	gr. ton	39.50 – 43.50
50%	gr. ton	72.00 – 75.00
Ferrotungsten, 70-80% per lb. of W.	lb.	.85 – .90
Ferro-uranium, 35-50%, of U, per lb. of U.	lb.	4.50 – .....
Ferrovanadium, 30-40%, per lb. of V.	lb.	3.25 – 4.00

Ores and Mineral Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 – $8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 – .....
C.i.f. Atlantic seaboard	ton	18.50 – 24.00
Coke, fdry., f.o.b. ovens	ton	4.25 – 4.75
Coke, furnace, f.o.b. ovens	ton	3.50 – 3.65
Fluorspar, gravel, f.o.b. mines, Illinois	ton	17.50 – 18.50
Ilmenite, 52% TiO_2 Va.	lb.	.01½ – .....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.39 – .41
Manganese ore, chemical (MnO_2)	ton	75.00 – 80.00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.65 – .75
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 – .08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ – .12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 – .....
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 – .....
Rutile, 94@96% TiO_2	lb.	.12 – .15
Tungsten ore, scheelite, 60% WO_3 and over	unit	9.00 – 9.25
Tungsten, wolframite, white, 60% WO_3	unit	8.85 – 9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 – 3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 – 12.50
Vanadium pentoxide, 76%	lb.	3.00 – 3.25
Vanadium ore, per lb. V_2O_5	lb.	1.00 – 1.25
Zircon, 99%	lb.	.06 – .07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.14½ – $0.14¾
Aluminum, 98 to 99%	lb.	.27 – .28
Antimony, wholesale, Chinese and Japanese	lb.	.14½ – .14¾
Nickel, 99%	lb.	.29 – 33
Monel metal	lb.	.32
Tin, 5-ton lots, Straits	lb.	.55½
Lead, New York, spot	lb.	.0935
Zinc, spot, New York	lb.	.0780
Silver (commercial)	oz.	.68½
Cadmium	lb.	.60 – .62
Bismuth (508 lb. lots.)	lb.	1.50 – 1.55
Cobalt	lb.	2.50 – 3.00
Magnesium, ingots, 99%	lb.	.90 – 95
Platinum, refined	oz.	117.00
Mercury 75	lb.	72.00 – 73.00
Tungsten powder	lb.	.95 – 1.00

Industrial Developments of the Week

New Construction and Machinery Requirements in the Process Industries

Some Opportunities This Week

Acids, electrolyte, wax, etc.	Los Angeles, Calif.
Cannery	Sparta, Wis.
Carbide	Anniston, Ala.
Cement	La Jolla, Calif
Cement	Easton, Pa.
Chemicals	Indianapolis, Ind.
Fabricating plant	Birmingham, Ala.
Fabricating plant	Montreal, Que.
Fertilizer plant	Salinas, Calif.
Gas	Oakland, Calif.
Laboratory	Poughkeepsie, N. Y.
Paint	Indianapolis, Ind.
Paper	Los Angeles, Calif.

Middle Atlantic

N. J., Ridgefield Park—The Flintkote Co., Maple and Paterson Aves., East Rutherford, manufacturer of roofing products, has awarded a general contract for the construction of a 1 and 2 story plant to replace the one recently destroyed by fire, to Ferber Construction Co., 16 Johnson Ave., Hackensack, N. J. Estimated cost $100,000 including equipment.

N. Y., Poughkeepsie—Vassar College is having plans prepared for the construction of a laboratory, estimated cost $200,000. Ewing and Allen, 101 Park Ave., New York City, are architects.

Pa., Easton—The Bath Portland Cement Co., Bath, has had plans prepared for the construction of a cement mill at Sandts Eddy, near here, estimated cost $1,500,000. The Public Service Production Co., Public Service Terminal Bldg., Newark, N. J., is engineer and will also be in charge of construction.

Pa., Philadelphia—The General Smelting Co., Stock Exchange Bldg., has awarded a general contract for the construction of a 1 story plant on Westmoreland St., to H. E. Baton, Inc., 1713 Samson St., Philadelphia. Estimated cost $20,000.

South

Ala., Anniston—The Southern Manganese Corporation, T. Swann, Pres., and The Federal Phosphorus Co., R. I. Ingalls, Birmingham, Vice-Pres., of the two concerns have filed petition for charters for two additional corporations here. The Federal Carbide Co., has been formed for the purpose of manufacturing carbide and substances of similar characteristics and the Federal Abrasive Co., for the manufacture of aluminous abrasive carbide.

N. C., Salisbury—The Carolina Rubber Co., recently organized, J. Collins, Pres., Kanawha Bank & Trust Co. Bldg., Charleston, W. Va., G. E. Rusher, Secy., Salisbury, have taken over plant of the Paul Rubber Co., and will continue existing business.

Tenn., Erwin—The Erwin Feldspar Corp., 3405 Clifton Ave., Baltimore, Md., plans to make enlargements to its grinding plant to develop a capacity of approximately 3000 tons monthly. The company recently took over the local plant and properties of the Crabtree Feldspar Corp., R. W. Lawson is president.

Tenn., Memphis—Bd. of Trustees, University of Tennessee, Medical and Dental Dept., H. A. Morgan, Pres., plans the construction of additional buildings including chemistry and laboratories, estimated cost $300,000. Jones & Furbringer, Porter Bldg., Memphis, Tenn., are architects.

Middle West

Ind., Indianapolis—Eli Lilly & Co., 210 East McCarty St., plans the construction of a 6 story, 100 x 260 ft. chemical manufacturing plant, estimated cost $800,000. R. F. Daggett, Consolidated Bldg., is architect.

Ind., Indianapolis—Lilly Varnish Co., 670 South California Ave., awarded the contract for the construction of a 4 story, 82 x 42 ft. paint factory, to W. P. Jung & Sons Co., Massachusetts Ave., Indianapolis, estimated cost $160,000.

O., Toledo—The Bunting Brass & Bronze Co. will soon receive bids for a 3 story addition to its plant. Mills-Rhines-Bellman & Nordhoff, Ohio Bldg., are architects.

Wis., Sparta—Sparta Canning Co. awarded the contract for the construction of a 2 and 3 story, 64 x 300 ft. cannery, to Nasset Bros., Sparta. Estimated cost $100,000. Owner is in the market for canning machinery.

This page is of value not only as a machinery market but also as an index of the general activity and growth of the industries served by Chem. & Met. The reports are gathered by our regular correspondents who are instructed to verify every detail. Requirements for new machinery will be published here free of charge.

West of Mississippi

Ark., Van Buren—The Twin City Brick & Tile Co., 516 North 13 St., recently organized, J. W. Hansell, Pres., plans the construction of a new plant, estimated cost $45,000.

Mo., Hannibal—International Shoe Co., 1505 Washington St., St. Louis, has acquired the plant of Hannibal Rubber Co., and will install machinery for the manufacture of heels. Estimated cost $300,000.

Okla., Sapulpa—The Sapulpa Refining Co., operated by the Mutual Oil Co., plans extensions and improvements to its refinery, estimated cost $30,000, including equipment.

Far West

Tex., Ft. Worth—Mont-Tex Corp., A. W. Terpening, Pres., 607 Burnett Bldg., plans the construction of a carbon black plant. R. F. Goodnature, A. S. Hatch, 607 Burnet Bldg., are engineers. Owner is in the market for equipment.

Calif., La Jolla—The La Jolla Cement Tile Works, has been purchased by C. C. Ostander, owner of the Waterproof Cement Tile Works, San Diego. New machinery will be installed to enlarge the output of the plant.

Calif., Los Angeles—Los Angeles Chemical Co., 2200 Santa Fe Ave., had plans prepared for the construction of a 1 story, 80 x 80 ft. plant on Butte St., for the manufacture of acids, electrolyte, wax, wood preservative, collodial clay, stucco, water softeners, etc.

Calif., Los Angeles—Pioneer Paper Co., 55th and Alameda Sts., awarded the contract for the construction of a 2 story, 40 x 140 ft. annex to factory on Alameda St., to V. P. Gilbert, Citizens National Bank Bldg.

Calif., Los Angeles—Western Talc & Magnesite Co., East 2nd St., has had plans prepared for the construction of a 1 story, 25 x 150 ft. factory at River near 1st St. A. G. Bailey, 4100 Hillstreet Bldg., is architect.

Calif., Oakland—California Compressed Gas Co., 71 Steuart St., San Francisco, is having plans prepared for the construction of the first unit of plant on Wood St., between 22nd and 24th Sts. Acetylene gas used in welding metals and cutting steel will be manufactured.

Calif., Salinas—California Sea Products Co., plans to rebuild fertilizer plant on Moss Landing, which was destroyed by fire, cost will exceed $40,000.

Canada

N. S., Amherst—Canadian Fireclay Refractories, Ltd., F. P. Hickey, Purch. Agt., is in the market for complete equipment for new plant.

Que., Montreal—The Manchester Foundry Co., Ltd., c/o A. Lalonde, 35 St. James St., plans the construction of a plant for the manufacture and fabrication of malleable iron, gray iron, steel, etc.

Unverified

La., Baton Rouge—Texas Chemical Co., Scanlan Bldg., Houston, Texas, plans the construction of a plant about 5 miles from here, work to begin about Jan. 1, estimated cost is $750,000.

Mich., Calumet—The Calumet & Hecla Co., plans to expand its copper smelting plant to include the enlargement of furnace equipment and the installation of electric power apparatus and automatic dipping, charging and slag haulage equipment.

Mo., Pierce City—Lime Phosphate Corp., recently organized, L. E. Brougher, Pres., F. W. Voelpel, Secy., Aurora, Mo., plans the development of 1,250 acres and is receiving bids for crushing and drying machinery.

S. C., Anderson Anderson Cotton Oil Co., West Market St., plans to rebuild meal grinding department, recently destroyed by fire with loss of $10,000.

S. C., Columbia—Fire Proof Building Material Co., 1522 Main St., recently incorporated, D. G. Ziegler, Pres.-Secy., capital $50,000, plans the construction of a 2 story, 40 x 80 ft. plant for the manufacture of general line of fireproof building material.

Tex., San Benito—The Valley Refining Co., plans the construction of a new oil refinery to develop an initial output of 500 bbl. per day. A department will be installed for the production of lubricating oils and grease, estimated cost $100,000 including machinery. C. B. Hedrick and T. J. Holmsley, Dallas, Tex., head the company.

Incorporations

H. H. McKee & Sons, Inc., New York City, produce sand, clay, minerals, etc., $200,000; F. A. Huck, 254 Echo Place, Bronx.

The Faraday Corp., Dover, Del., manufacture and deal in iron, steel, brass and aluminum, $4,500,000.

Keystone Papeterie Co., Wilmington, Del., manufacture and deal in papeteries, tablets, paper, envelopes, paper boxes, $200,000.

Eastern Asbestos Co., Providence, R. I., $100,000.

Hamburg Ridge Lime Co., Inc., Dover, Del., limestone, $100,000; Cooper & Cooper, Dover.

Essential Oil Products Corp., New York City, $20,000; J. Seaman, M. Rosenweig, A. Weinstein. (Attorney, N. Seaman, 51 Chambers St., New York City.)

Asco Products Corp., Wilmington, Del., dyeing, printing and bleaching, $500,000; (Delaware Registration Trust Co.)

Arbett Oil Co., Wilmington, Del., refinery, $500,000. (Corp. Trust Co. of America.)

Richmond Petroleum Co. of Venezuela, Wilmington, Del., manufacture, $500,000. (Corp. Trust Co. of America.)

Standard Chemical Products Co., manufacture and sale of mineral and chemical products, $2,000,000.

Penn. & Jersey Clay Products Corp., New York City, $50,000; T. W. E. Smith, R. W. Lyle, E. Miller. (Attorney, C. Kimball, 115 Broadway, New York.)

W. S. & L. Manufacturing Corp., Wilmington, Del., chemists and dye makers, $300,000; (Colonial Charter Co.)

The Thompson Specialties, Inc., Springfield, Mass., chemicals, $180,000; H. O. Thompson and T. C. Leete, Longmeadow and C. H. Seltzer, Springfield.

Marvelo, Inc., Caldwell, N. J., cleansing products, $50,000 preferred 2,000 shares common, no par. Strange & Myers, 149 Broadway, New York City.

Anti-Rust Paint Co., New Orleans, La., $20,000; L. O. Higgins, Pres., 2301 Wirth Place, G. A. Werner, Secy.-Treas., 3128 Upperline St.

Dunbar Molasses & Syrup Co., Inc., 3300 Chartres St., New Orleans, La., $100,000; M. Levin, Pres., J. L. Rothschild, Secy.-Treas.

Dixie Wax Paper Co., 1307 Plowman St., Dallas, Tex., increased capital from $20,000 to $50,000.